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# The Book of Knowledge

## The Children's Encyclopædia

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8-21-40 Mrs. John Mc[illegible]

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The fire dies down in the cottage. From the painting by Walter Langley, R.I.

# WHY DOES THE FIRE GO OUT?

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A FIRE, or anything else that is burning, will go out if the supply of air or oxygen to it is stopped, or if that supply is made so scanty that the burning goes on very slowly, and so does not produce enough heat to keep the coal, or whatever is burning, at the temperature at which it is capable of combining with oxygen; or a fire, or anything else, will go out when there is nothing more left to burn. When a fire goes out in the ordinary way, there is still plenty of burnable stuff left in the grate; and there is still plenty of air in the room, of course; but there is not a good enough draught up the chimney, and the air of the room is not getting to the coal of the fire quickly enough. The air enters the fire almost entirely from below; but perhaps there are many ashes in the grate, choking up the spaces between the bars, and the air cannot get to the coal. So the fire dies of suffocation: it cannot get air. If we clear away the ashes the fire goes on burning.

### HOW CAN THE FIRE IN THE CENTRE OF THE EARTH BURN WITHOUT AIR?

Almost everyone is puzzled by the two different ways in which a thing may give out heat and light. A thing does this when it is hot; but it may be hot either because it is burning, or for some other reason. The fire is hot *because* it is burning, and that is why it gives out heat and light; the thread in an electric lamp gives out heat and light *because* it is hot, but it is hot not because it is burning, but because it is made hot by electricity passing through it; the sun gives out heat and light because it is hot, but the sun is not burning. The sun is actually so hot that oxygen cannot combine with the other elements of the sun. The sun's heat is entirely due to other causes. Similarly, the centre of the earth is like a fire, since it gives out a great quantity of heat; but it is unlike a fire in that it is not burning any more than the sun is, or the thread in an electric lamp. We should use the word glowing, and then we can say that the sun and the inside of the earth are glowing though they are not burning. The current through an electric lamp makes the thread glow, though it does not burn. A fire, and many other things, glow when they burn because the burning makes the things so hot that they glow. Any kind of matter that is made hot enough will glow; that is to say, will give out light and heat. The proper way of saying this now is that it will radiate, or give off rays of light and heat.

### WHY HAS THE EARTH NO LIGHT OF ITS OWN LIKE THE SUN?

There is no doubt that the earth had a light of its own long ago, and this thoughtful question very rightly suggests that the other planets, too, must surely have had a light of their own at one time, just as the sun has, because the sun and the planets were all made from the same hot cloud, or *nebula.* Now, the question we have to answer is why the earth should have become cool, while the sun still remains hot, so that it can no longer give out any light of its own, but can only reflect the sun's light. The reason is that the smaller a thing is, the more quickly does it lose its heat. The heat escapes from the surface, and the smaller a thing is, the larger is its surface in proportion to the amount of stuff in it. If we go to a place where people are making glass, and get them to make us three or four balls of glass of very different sizes, we shall find that the little one is quite cool when the biggest one is still far too hot for us to touch it.

A baby needs warmer clothing than a grown-up person, and small and thin people need more clothing than large people, because they have such large surfaces to lose their heat by in proportion to the mass of their bodies. As regards the solar system, we can learn especially from the moon and from Jupiter. The only reason why the moon should have become so much cooler than the earth, though it is made of the same stuff, is that it is so much smaller. On the other hand, Jupiter is very large, and astronomers are almost sure that the giant planet is still hot enough to give out some light of its own.

### WHY DOES OIL BURN SO EASILY?

Oil is a word covering a great many things, but though these things differ in many ways—in taste and colour and smell, and in their chemical composition—yet all oils agree in consisting of a very large amount of the two elements carbon and hydrogen. Many oils contain a certain amount of oxygen, but no oils contain nearly enough oxygen to satisfy the carbon and hydrogen atoms in them. If hydrogen is to be fully burnt, every two atoms of it need one of oxygen, as in water, $H_2O$. If carbon is to be fully burnt, every atom of it needs two atoms of oxygen, as in carbonic acid, $CO_2$. No oil contains anything like this proportion of oxygen to the carbon and hydrogen in it, and so all oils are capable of being burnt; that is to say, of being made to combine with oxygen—and they will go on burning until all the carbon and hydrogen in them have combined with all the oxygen they are capable of combining with; and then when the oil is completely oxidised it is completely burnt, and cannot possibly burn any more.

### IS IT BAD TO SLEEP WITH THE MOON SHINING ON US?

It is not bad to sleep with the moon shining on us, but it is very bad to believe nonsense. Every night that the moon shines, millions of animals sleep with it shining upon them, and if anyone fancies that it is bad for human beings to sleep out of doors, whether the moon is shining or not, he makes a great mistake. All notions of this kind are really remnants of the old astrology, which ascribed all sorts of influences to the heavenly bodies, and thought that lunacy—the word came from the Latin *luna,* meaning the moon—was caused by the moon. Moonlight is only reflected sunlight, and, though it is very feeble in proportion to its brilliance, it is valuable, just as sunlight is.

### WHY IS IT DANGEROUS TO SLEEP IN A DAMP BED?

One of the greatest facts about water is the enormous amount of heat which it can hold, and the very great quickness with which it can take heat from anything else—in other words, it has a great capacity for heat, and it is a very good conductor of heat. When we sleep in a damp bed, then, the water in the sheets or blankets rapidly takes a large quantity of heat from our bodies—far more than dry sheets or blankets are capable of taking. This means that the temperature of our bodies is lowered because heat is taken from them more quickly than we can make it up by our burning. But if the temperature of the body and of the blood is lowered, its power of resistance to all sorts of microbes, such as those which cause pneumonia or inflammation of the lungs, and those which cause rheumatic fever, is also lowered. And so we are very liable to get any of these diseases, or influenza, or bronchitis, or a common cold, or some others. If we think that the sheets on a bed are damp, we should take them away and sleep in the blankets. It is not so comfortable, but it is nothing like so bad as getting pneumonia.

### WHY DO BABIES REQUIRE MORE SLEEP THAN GROWN-UP PEOPLE?

There is no doubt that babies do require more sleep than grown-up people of any kind, and the smaller the baby, the truer this is. It has been well said that "the whole duty of infancy is sleeping and feeding." Grown-up people require to sleep because they require a period of rest during which their bodies can save and make up for the wear and tear of the waking time. As long as a grown-up person's body can just maintain itself, each night's sleep balancing the loss and injury of the day's work, then all is well; no more is needed. But the body of a child, and, still more, of a baby, has far more to do than this. It has to make itself, whilst the body of a grown-up person is already made and merely has to maintain itself. The body of a baby or a child has to develop and grow. When it is awake, it takes its food by which it grows, but the real growing is done when it is asleep. Then the body uses the food which has been taken in the daytime, and builds it up into itself. If a child, and still more if a baby, does not get sufficient sleep, it cannot grow properly.

### WHY, ON WAKING UP, DO WE SEEM TO HAVE SHUT OUR EYES ONLY A MINUTE AGO?

When this happens, the reason is that all our notions of time and its passage come from our consciousness of what goes on in ourselves. That is what gives us our idea of time; and so when we are asleep and unconscious, time does not exist for us, and when we wake, it seems as if time is going on from just where it left off at the last moment we can remember before going to sleep.

But I fear we shall find when we grow up—or perhaps, if we happen to be not quite well, even before we grow up—that our consciousness of time is not always cut off when we are asleep. Children sleep very deeply; if they did not they could scarcely become grown up. But grown-up people often sleep less deeply, and they may be so little asleep that, though they are not really awake, yet they have a sort of half-consciousness of things going on in themselves or around them, especially things in themselves. When we have had a night of this sort of bad, and almost useless sleep, and at last wake fully up in the morning, it by no means seems to us that we have only shut our eyes a minute ago. More often it seems as if the night had been ages long. An hour of deep sleep is worth more than many hours of light sleep, and the deeper our sleep has been, the more valuable sleep we have had.

### DO OUR BRAINS WORK WHILE WE ARE ASLEEP?

Part of our brains works always, whether we are asleep or not. If that part stops working, then sleep must become death. This is a part of the brain about which we never feel or know anything directly ourselves; it is the lowest part of the brain, and has nothing to do with thinking or consciousness, but it controls the beating of the heart, and gives the orders to the muscles by which we breathe. The highest part of the brain, that has to do with thinking, is probably never wholly asleep except, perhaps, in babies and small children. But most of it should be asleep, which means at rest, when we are asleep. The deeper our sleep is, the more valuable it is, and the smaller is the part of our brains which is still at work.

Dreams and nightmares prove that our brains work while we sleep. But, quite apart from them, we can prove in many ways that much, even of the higher part of the brain, works while we are asleep. Thus, for instance, a man may go to bed trying to solve some problem in science, or to complete a piece of poetry he is writing, or to invent a new combination of the pieces in chess, or to find out how a crime was committed, or to write a tune to the words of a song, or to do a thousand other things of that kind—and in the morning he may wake and find that during the night, while he was asleep, the brain has done everything he wanted. A great poet once composed a poem in his sleep, and wrote it out the next morning. Sometimes, when the brain has done its work, it will wake the man up, and if one is to be awakened at night, that is the nicest way in which it can happen. The French have a very good proverb which expresses this very well. It is, *La nuit porte conseil*—the night brings counsel.

### HOW DO WE KNOW WE HAVE DREAMED WHEN WE ARE AWAKE?

After all, this question, when we come to think of it, is only one regarding memory. We *remember* some of our dreams. A dream is an experience of a special kind; it is something happening in the part of our brain which has to do with consciousness and experience, and the brain's general power of memory applies to this as it does to other cases. But, of course, the brain is in a peculiar state when we dream. The whole of it is not working, and so our recollection of dreams is, as a rule, not nearly so good as that of our waking experiences.

The more clearly we remember a dream, the greater must have been the part of the brain machine that was working at the time, and, on the other hand, there is no doubt that we have many dreams which we do not remember at all when we wake, and which were due to the working of only a very small part of the brain. We see from this that we can judge which dreams are the best kind to have, if we are to have any. The more definite a dream is, the more vivid it is, and the better we remember it. The more awake our brain was when we dreamed, the less was the rest it was getting, the poorer and less valuable was our sleep. But when a dream is scarcely remembered, or not remembered at all, and when it is very faint and vague, then our brain was much less awake during the dream and our rest and sleep were so much the less injured.

### WHAT DO THE WORDS ROUND AN ENGLISH PENNY MEAN?

The words round the penny are written in Latin, which was once the language of scholars everywhere. Most of the words have to be written short to save room, and those that are so written have two dots after them. *Georgius* is simply the Latin form of George; *Dei* means "of God," and *gra.* is short for a Latin word, meaning "by grace." The next three words mean King of all the Britains—we know that *rex* means "king," and *omn.* in English words always means all, as in omnibus, which means "for all"—*fid. def.* means "Defender of the Faith," and the last two words, which we shall not find on pennies of fifty years ago, mean "Emperor of India." So that the whole inscription on a penny means:

"George the V. by the Grace of God, King of all the Britains, Defender of the Faith, and Emperor of India." I have a penny in my pocket dated 1866, on which the inscription ends with the words "F. D.," short for Defender of the Faith; but at that time Queen Victoria had not been proclaimed Empress of India, and so "Ind. Imp." is not there. If we look at coins of earlier reigns, we see that the inscription varies a little. Sometimes, for instance, the *omn*, is left out, and there is simply "*Britanniar.*"

### DO WE SEE A THING IMMEDIATELY WE LOOK AT IT?

Certainly not. Seeing, and every other kind of sensation, take time. From the instant that the light strikes the curtain at the back of our eyes to the instant that *we see* is quite a long time compared with some things—for instance, compared with the time it takes light to travel a mile. We are apt to think a second the shortest part of time that is worth mentioning, but that is absurd. A second is a period of time so long that light, radiant heat, and electricity could travel almost as far as the moon in such a time. The really wonderful thing about seeing is, that it takes such a small fraction of a second for all the things to happen which are necessary before we can see. Complicated chemical changes have to take place in the living cells of the curtain at the back of the eye. These changes have to produce special nerve currents, which in some amazing way correspond exactly to them, and these run along the eye nerves—first to a group of cells in the lower part of the brain, and then from them, along another set of nerves, to the real eyes—a group of nerve-cells at the very back of the brain, which themselves have developed, and have always lived, in utter darkness. Something happens in them, and then we say *we see.* The marvel is that only a few hundredths of a second are needed for all this that has been described to happen.

### WHY, WHEN WE HOLD A LUMP OF BEET SUGAR TO THE GAS, DO RED DROPS COME?

I think I would call these drops brownish rather than red, said the Wise Man, and if we try the experiment with a lump of cane sugar, I do not think we shall find much difference. We shall notice that this stuff in the brown sugar has rather a nice smell, and indeed it helps to make very nice sweetmeats. Sugar is a very complicated chemical substance, containing carbon, hydrogen, and oxygen. When it is completely burnt, of course it is all turned into water and carbonic acid, but when we put a match to it, or hold it in the gas, it is only partly burnt; in other words, the process of combining it with oxygen only goes part of the way, and so we get a number of oxidation products, as they are called, which contain more oxygen than sugar does, but much less, in proportion, than carbonic acid and water. So, if we could go on oxidising or burning the sugar, in the end we should oxidise or burn away this brownish red stuff completely into water and carbonic acid.

### WHY ARE DARK THINGS WARMER THAN LIGHT THINGS?

We can answer this question at once if we know the answer to the question, "Why are dark things dark?" A thing is dark, even in the light, because, instead of reflecting, or throwing back, the light from its surface, it keeps the light, or, as we say, absorbs it. Light and radiant heat are really the same thing, and as a rule anything which absorbs or reflects the one, absorbs or reflects the other. So light clothes throw back from their surface the light and the heat that strike them. Probably nothing will throw back all the light and heat that strike it, and even the whitest snow will melt under the sun's rays. But while light things keep only a little of the light and heat that fall on them, dark things absorb practically the whole, and so, of course, they get warm. Thus a suit of white flannel, for instance, will become really warmer to wear if it is simply dyed black.

### HOW MANY MILES IS THE SKY FROM US?

What we call the sky is nothing but the appearance of blue that we get on a bright day, owing to the fact that particles in the air reflect the blue part of sunlight to our eyes. When we see the blue sky, then, what we really see is air. The height of the particles that reflect this blue light to our eyes is not very great. It is perhaps fifty or sixty miles at the most, and, compared with the size of the universe, that is nothing at all. But by the sky we may mean, not the blue sky of daytime, but the great space around us, that we may see on any bright night. We see vastly farther then than in the daytime, because we can see right through the air out to the stars; whilst in the daytime the sun is lighting up all the air around us, so that, though we seem to see a long way, we really cannot see past the lit-up air—except when there is something very bright beyond it, such as the sun itself, and sometimes even the moon.

### DO WE KNOW HOW FAR THE SKY REALLY GOES?

If we study the distance of the stars, that in itself, of course, teaches us something as to "how far the sky really goes." But when we have learnt the enormous distances of some of the stars which we can see—distances so great that there is no space to write them in miles, and so we have to speak of light-years, meaning the distance that light travels through in a year—even then we have not begun to say how far the sky goes. If we had a telescope a million times bigger than the biggest we have, and then could find with it the farthest star that it would reveal, we should even then be no nearer the end of the sky than we are now, for there is no end to it. If we travelled out in a straight line through the sky for ever, we should never reach the end of it. That is what we mean when we say that space is infinite, which is simply the Latin word for unending.

### WHY DO THE HILLS LOOK BLUE AT A DISTANCE?

The blueness of the sky is due to the blueness of the air, which looks blue to us because tiny specks of matter floating in it reflect the blue rays of sunlight to our eyes. Now, if we look through a layer of anything that is coloured at something beyond it, the layer will contribute its own colour to the colour we see. The blueness of the air, however, is a very faint blue, and we do not usually notice the blueness it contributes to anything near. But when we look at distant hills, we are looking through such a thick layer of air that it gives them a blue tinge. But the actual colour which we see depends upon many other things, as, for instance, the colour of the hills themselves, and the time of day—which decides the angle at which the sunlight falls upon the hills, and also affects the colour of the sunlight. That is enough to explain why the colour of hills is so various and changes from moment to moment.

### IS THERE ANY WATER IN THE SUN?

We are quite certain that there is no water in the sun. We know that both oxygen and hydrogen exist in the sun, just as they do in the earth, and we cannot doubt that, as they have a great attraction for each other here to form water, they must have a great attraction for each other there. Yet there can be no water in the sun, because the sun is so hot that none of the elements, not even oxygen and hydrogen, can combine with each other there. By producing intense heat, we can force the oxygen and hydrogen of water apart, and that is what happens in the sun—or, rather, the sun has never been cool enough to allow them to come together.

### IS THERE ANY WATER ANYWHERE EXCEPT IN OUR WORLD?

Oxygen and hydrogen, which, when combined, form water, are found wherever we look for them through the universe. In the case of our own solar system, we can prove that, wherever the temperature is not too high, there oxygen and hydrogen, if found together, will combine to form water. That is true of our own earth; but, as we have seen, the sun's temperature is too high for it to be true of the sun. We should expect some of the other planets besides the earth to be cool enough for water to be formed, and in the case of the planet we know best, which is Mars, this is so. We have known for several years that something, which looked and behaved exactly like water, gathered at the North Pole and South Pole of Mars, forming caps of what looked like ice, that increased or decreased at each Pole according to its winter or summer. We also see occasional, but very rare, clouds in the atmosphere of Mars. Many people, however, said that the Polar caps of Mars were not made of water, but of solid carbonic acid, which looks like snow; but it has quite lately been proved that what looks like water on Mars *is* water, and so this very important question is answered.

### WHERE DOES THE SEA-WATER GO TO AT LOW TIDE?

The shortest answer to this would be that, at low tide, the water goes to the places where it is high tide. As the earth spins under the pull of the moon and the sun, the water is always being moved about. Of course, it is always somewhere, and if it is not in one place, it must be in another. When it is pulled to one part of the earth and heaped up there, that makes high tide. As we watch the tide rising, what we see is the water being heaped up in our neighbourhood, mainly under the influence of the moon. But if it is heaped up there, it is being drawn away from somewhere else, and that somewhere else is the place where the tide is ebbing. No tide rises but some other tide falls.

### WHY DOES IRON FEEL COLDER THAN WOOD?

Our feeling whether anything is hot or cold does not depend wholly upon how hot or cold the thing really is. The marble on the washstand and the towel beside it are both of the same temperature, but the marble feels much colder than the towel. All the parts of a hammer are at the same temperature—unless, of course, one end of it has been heated—and yet the iron head feels much colder than the wooden handle. In all these cases the thing we feel is colder than our skin as a rule, and so heat will flow from our skin into the thing. Our feeling entirely depends on the rate at which the thing takes heat from our fingers. Marble and iron take heat quickly from our fingers; they quickly make our fingers cold, and so we say that they are cold, meaning really that they make us cold.

But wood and cotton do not take heat away nearly so quickly from anything warmer than themselves, and so we say that they are not so cold. Really we should say that marble and iron are good conductors of heat, but wood and cotton are bad conductors of heat.

### WHY DO DARK THINGS LOOK SMALLER THAN LIGHT THINGS?

When we see a dark thing against a light background or a light thing against a dark background, it is really, of course, only the light that we see. We see a perfectly dark thing only by contrast with the light around it, and if the light around it were not there, we could not see it at all. We cannot see darkness. Now, it is an interesting fact about the eye, which it is not difficult to understand, that when any part of it is excited by light, the effect of the light spreads a little all round the edge of the part of the eye on which the light falls. It is as if the little light at the edge of it radiated sideways, and so it is called *irradiation*.

Now, when we see a black spot, like a blot of ink, on a piece of white paper, irradiation works in the eye, of course, so as to make that spot appear smaller than it really is, for all round the edge of the part of the eye which is opposite the spot, and on which the light is not falling, a little of the effect of the light from the white paper is being felt. When we see a white spot on a dark background, irradiation works outwards from the white spot into the part of the eye which is really opposite the dark, and so the white spot looks bigger than it really is.

### WHY ARE SOME PLANTS POISONOUS?

When we say a thing is poisonous we mean that it is poisonous to us. Some things which are poisonous to us are poisonous to all living creatures, but most things are poisonous to some creatures and not to others; indeed, they may be very good for the others, just as when we say "one man's meat is another man's poison." So long as we have the old idea that every living creature exists for our benefit, it is indeed a puzzle why some plants should be poisonous, why some snakes should be poisonous, why there should be disease-causing microbes, or why tigers should have claws. But if we understand that every living creature exists *for its own sake*, then we shall look at the claws of the tiger, or the poison of the snake or plant, and ask: "How do they serve the life of the creature that has them?" We are only now beginning to learn the meaning and the uses of the various chemical compounds, poisons and others, which we find in plants. Some of them seem to be waste products that the plant is gradually getting rid of; or sometimes the poisons of a plant exist to warn off insects, or other forms of life, which would injure the plant.

### WHY DOES IT THUNDER, AND WHICH SIDE OF THE CLOUDS IS THE THUNDER ON?

Thunder is a noise, an irregular wave in the air. Its cause is the very sudden heating of the air, high up above our heads, by the quick passage of electricity through it from cloud to cloud, or from a cloud to the earth. Air offers great resistance to the passage of electricity through it, and when anything resists the passage of electricity, that thing becomes hot. If it becomes hot, it expands suddenly, and so it starts the air-wave we call thunder. A sound—and the same is true of a light made at any place—spreads out, if it can, quite equally in every direction. So the sound of the thunder spreads upwards from the clouds, downwards from the clouds, and sideways through the air and through the clouds themselves. The part we hear is, of course, the part that reaches our ears, part of the wave that spreads downwards from the place where the electricity passed and started it.

### HOW LONG DO MICROBES LIVE?

The answer to this question is one of the most extraordinary facts in the world. Of course, a microbe, like anything else, may be killed because it is poisoned, or crushed, or made too hot, or because the water is taken out of it, or, most commonly of all, because it cannot get enough food. But when we ask this question about microbes, we mean: How long do microbes live naturally? And the answer is that *microbes do not die*. The natural end of the life of a microbe, and of other living creatures like the microbe which consist of only one cell, is not to die, but to divide into two pieces, each of which grows and becomes a new microbe, as we see in the pictures on page 848. That is the very simple way in which the race of microbes goes on. If the whole body of a living thing divides into two parts which become two living things, each of which does the same in its turn, then we cannot say that in such a case death happens at all. Many a long book might be written on all that this means, when we compare it with the other kinds of life with which we are so familiar.

### WHAT IS THE SHORTEST LIFE IN THE WORLD?

Microbes, and many other creatures, belong to a group of plants with a special name that means the plants that split, because they split into two, so as to form new microbes. From the moment that one microbe has split, until its two halves, having grown themselves, split in their turn—we may call the length of a microbe life. It is the shortest life in the world. The microbe that causes cholera, for instance, splits into two after about twenty minutes, reckoning from the moment when it was first formed out of half of the microbe that went before it. One microbe in twenty-four hours has been found to multiply into eighty thousand. But we must, of course, understand that the rate at which microbes grow, and split, and so multiply, depends upon conditions, and especially upon the food supply. If there is not enough food, or if there is a tiny quantity of some antiseptic, perhaps, such as carbolic acid, the microbes may remain for a long time without splitting, or they may be killed.

### WHY DO NOT ORANGES GROW IN ENGLAND?

Every kind of living creature has certain conditions in which it is fitted to live, certain places which it inhabits. So we use a special word, and say that the sea is the *habitat* of the fish, England of oaks, Spain of oranges, and so on. Some creatures can live in a greater variety of conditions than others. We know only one creature that can keep himself alive in any part of the world, and that is man. But even he lives and works best neither in the tropics nor in very cold countries. Of all the conditions which affect the growth of living things, perhaps the temperature is the most definite. Thus, when we go up a high mountain in a warm country, we can trace, as we go upwards, different kinds of plant life, each corresponding to the different levels of the mountain as it gets higher and colder. The orange-tree is one which requires a hotter average temperature of the air than is found in England, though by no means the very hottest to be found anywhere. So if men alter this one condition of temperature, we can make the orange-tree grow in England quite well, as may be seen at Kew Gardens.

### WHEN WATER IS BOILING, WHY CAN IT NOT BE MADE HOTTER?

When water is boiling it can be made hotter, but not as liquid water. Water, like other things, has a certain temperature above which it cannot be a liquid, but must be a gas, and below which it cannot be a gas, but must be a liquid or a solid. That point we call the boiling point. We cannot make water hotter than boiling point, because when we do it ceases to be what we usually call water, and turns into gaseous water, or water-vapour, but it is quite possible to make water-vapour hotter than the temperature of boiling water. If we go on boiling water, we are certainly putting heat into it; and we must not fancy that because the liquid water gets no hotter, the heat is being lost, or wasted, or turned into nothing. Nothing is ever lost, or turned into nothing. What the heat does is to put itself into the liquid water, so that that liquid water takes the form of a gas, and the heat still remains, though rather changed, in the energy of movement of the parts of the gas. We can easily prove that the heat is doing something, though it is not making the water hotter, when we find that if we go on boiling we boil all the water away; that is to say, we turn the whole of it into water-vapour.

### WHY DO WE SOMETIMES SAY "GAS" AND SOMETIMES "VAPOUR"?

It is a pity to have two words for the same thing, when they confuse people. You and I, said the Wise Man, are rather apt to think of a vapour as something in the air that we can see; that is to say, something that we cannot see through. But a vapour is really a gas, and a gas is a vapour. Only when a thing at ordinary temperatures is usually gaseous do we call it a gas. When we know a thing best as a liquid or a solid, such as water, we call its gaseous form a vapour. So a vapour is simply a gas, or the gaseous form of a thing that we know best as a liquid or a solid.

### WHY DOES BOILING WATER FEEL LIKE COLD WHEN WE PUT OUR HANDS IN IT?

Though we can gain no knowledge except through our senses, we know that they are very apt to deceive us; and the general rule about this is, that the senses deceive us least when they are concerned with something we are accustomed to; but they deceive us most when there is something unusual about the thing we are feeling or seeing. Another general rule is, that the senses are apt to deceive us when they are being excited very intensely. They work best with things they are accustomed to, and with things that excite them neither very little nor very much. In the skin of the hand, there are special arrangements for feeling both hot and cold, and it is a very interesting fact that, as the question points out, when the sensation of heat is extremely acute, the brain is deceived for a moment or two, and makes us feel as if we were touching something very cold. But no one can explain how this mistake comes about; only this question is well worth thinking about and storing away in our minds with other instances of the mistakes that our senses make.

### HOW DO CLOUDS STOP SUNLIGHT IF THEY ARE PURE WATER?

In all its forms, water stops and takes into itself a certain amount of the light of the sun. We know that liquid water does this, for it very soon becomes darker as we go down through it. Solid water, or ice, does so, too. Gaseous water does so least, and the gaseous water which is always present as part of the air does not stop enough of the sun's light for us to notice. But water in the form of round drops suspended in the air, which is what clouds are really made of, can stop a great deal of the sunlight.

We can understand this at once if we remember what a soap-bubble looks like. Here is a bubble made mostly of water; it has a beautifully bright and glittering surface. That means that the light falling upon it is very largely thrown back from its surface. So if there is a cloud made of millions of tiny bubbles or drops—which are also glittering things—it will throw back a great deal of the light that falls upon it. We can understand this when we see the lighted side of a cloud. Nothing could be more brilliantly and perfectly white than the clouds like snowy mountains, which we often see. They are white and bright just because they do not allow the sun's light to pass through them, but reflect, or throw it back, from themselves.

### WHY CAN WE HEAR THE SCRATCHING OF A PIN AT THE OTHER END OF A POLE?

Sound is made of waves in matter, waves of a certain kind and rate which our ears can hear. Any kind of matter may be thrown into these waves, and so may convey sound. The thing that conveys the sound, and in which the waves are, is called the medium, which really means the *thing in between*. By far the commonest medium for sound in our case is the air. In the case of fishes, of course, it is the water. But many solid things convey sound-waves extremely well, and when we scratch one end of a long pole with a pin, the matter of which the pole is made is thrown into a series of waves, that go on as long as the pin continues to move, and that we can readily hear through our ear, or perhaps even by merely putting our end of the pole against the side of our head or against our teeth; but the ear is best because it contains special arrangements for conveying sound-waves to the real ear inside our head much better than the bones of the skull or face can do. We have all heard stories of how the Indians can hear sounds at great distances by putting their ears to the ground, and this shows us that the earth may convey sound-waves—that is to say, waves which our ears can feel and appreciate as sounds—just as well as air, or water, or a pole.

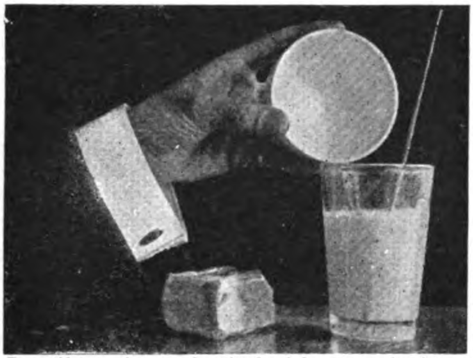
### WHY DID THE PEOPLE OF LONG AGO LIVE LONGER THAN THE PEOPLE OF TO-DAY?

Ah, but before answering this question there is another question that must be asked first: "Did people who lived long ago live longer than people do now?" And I have no doubt at all that the answer to that is "No." In all sorts of old records we are told that people lived to great ages; but there are many ways in which this can be explained, one of them being that there were different ways of reckoning age in those days. All the real evidence that we can get from the study of the past, and from our knowledge of uncivilised peoples now living on the earth, shows us quite definitely that the average duration of human life is increasing. The expectation of life, as it is called, of the people who live in our land now is definitely longer than it was twenty, or even ten, years ago, and far longer than it was a hundred years ago.

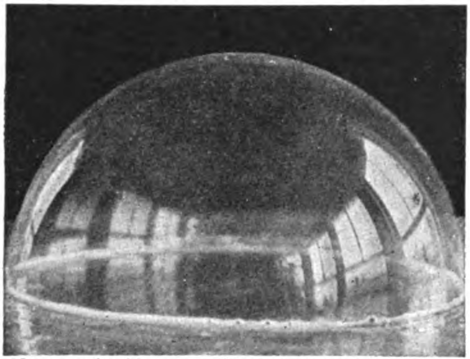
Perhaps we have noticed that when human beings are children, there is a time when they can hardly distinguish between facts and things that they have imagined. Just in the same way, when mankind was younger than it is now, historians mixed up fact and fancy, not with any desire to deceive, but probably because, in their own minds, they could not keep the two things strictly apart. Many of their fancies were worth putting down and keeping; but nowadays we must try to learn which was fact and which was fancy in what they tell us. Only thus shall we get right ideas of the past.

THE NEXT QUESTIONS BEGIN ON PAGE 3429

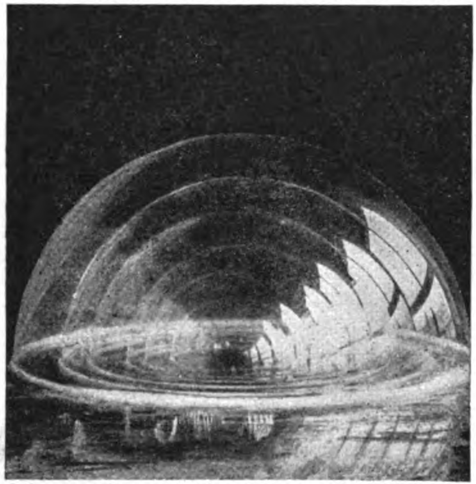
# WHAT TO DO WITH SOAP-BUBBLES



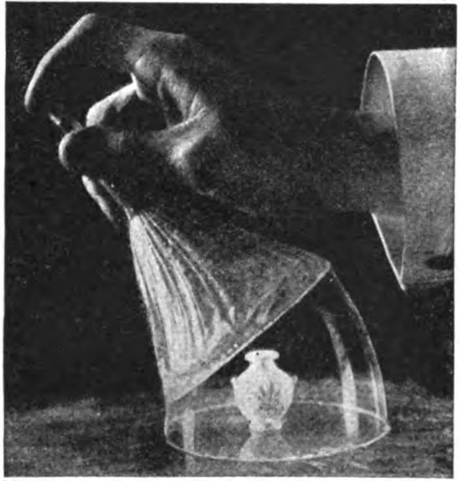
Beautiful results can be obtained from soap-bubbles. We must first make a strong lather by rubbing a piece of best yellow soap in water, skim off the mass of suds from the surface, and pour the solution into a tumbler as here shown. The solution must not be stirred.



Next we should smear a little of the solution upon a sheet of glass, and blow a bubble through a thin straw. Then, dipping our finger into the solution, we must try to put it right through the side of the bubble. If we can do this without bursting it, the solution is ready.

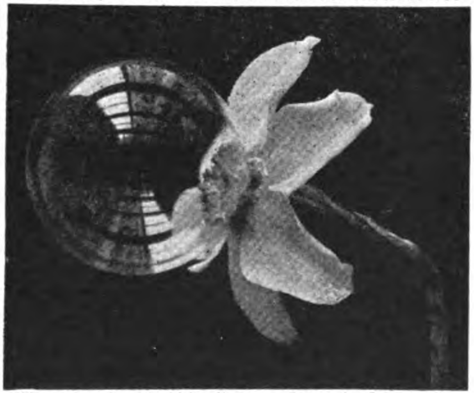


It is now quite easy to blow a great number of bubbles, one inside the other, on a sheet of glass, as shown in the picture. For each bubble the straw should be dipped right into the solution, for if any portion of the straw is dry, it will burst the bubbles when it touches them.



Now let us smear a glass, and also an ordinary funnel, with solution, put the funnel over a little vase, and blow down the funnel, slightly raising it while doing so, until a bubble is formed. Then placing a finger on the top of the funnel, we can turn it over until the bubble is free.

Here we see the result of the last action; this beautiful little vase is standing on a sheet of glass completely inside a bubble. Little model houses and toys can be placed inside a bubble by the funnel, in the same way.



We can make a bubble cling to a flower by first putting the flower in the solution, and then blowing a bubble through the straw on to it. Bubbles can be made to cling to most objects that have been dipped in the solution.

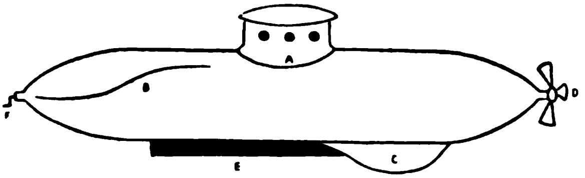
# THINGS TO MAKE AND THINGS TO DO

# HOW TO MAKE A TOY SUBMARINE

CONTINUED FROM 3286

Most boys have either seen a real torpedo boat, or have seen a picture of one dashing over the sea. They are wonderful little ships that travel almost as fast as an ordinary railway train—twice as fast as the great men-of-war that they are intended to destroy. They dash out at a speed of nearly forty miles an hour towards the great ships, and, when they are quite close, they fire one of the deadly torpedoes they carry, and the torpedo swims under water like a fish, until it strikes the big battleship. Then it explodes and blows a huge hole in the side of the ship. One torpedo would sink the biggest ship ever built if it struck the hull under the water line.

But there are even more wonderful boats than these. They are the "submarines"—the little torpedo boats that swim entirely under water so that no ship can see them coming. They can dive deep down out of sight and fire their torpedoes while they are almost underneath the great battleships.



1. The submarine boat complete. The letters mark: *a*, Conning tower; *b*, curved fin; *c*, keel fin; *d*, propeller; *e*, lead keel; *f*, handle.

Perhaps it has never occured to you that you might make a model submarine that would swim under water just like the real ones. Yet you will not find it difficult if you read this description first, and when you have completed it you will find it one of the most fascinating things you have ever had.

You can make it swim in a bath or a small pond. It will dive under water and travel twenty or thirty yards before it comes up again. With your submarine torpedo boat you can play at a naval battle with your friends who have ordinary wooden boats that float. The floating boats will represent the men-of-war, and you will try to make your submarine swim under the water and hit them. If it touches a boat you must consider that boat destroyed, for that is what would happen in real war if a submarine got close enough. Now let us see how to make it.

First, you must get a piece of wood about eight inches long and two and a half inches thick. A piece of curtain pole will do splendidly, if you can find one that is made of soft wood. With a sharp knife you must cut the two ends to rather sharp points. When this is done your piece of wood will look like a big cigar. The ends should be rubbed with sand-paper till perfectly even.

Now you must drill a hole from one end of the wood to the other. This can be done with a long gimlet. You can bore from each end till there is a hole right through.

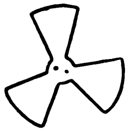
Next you must buy a pea-shooter from a toy-shop—it will cost a few cents—and with a file you must cut off two pieces about one inch long. You must make the hole rather bigger at each end of the wood and let in the pieces of pea-shooter. Each piece should project a little, as you can see in the illustration number 5.

Now you must make the propeller, or "screw," that will drive the submarine. This will be quite easy. You have only to knock the bottom out of a small tin can, and cut it to the shape shown in picture 2. The fan-shaped pieces must be twisted slightly like the propeller of a real ship.

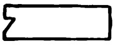
Now drill two small holes in the centre, close together, and pass a piece of elastic through them—the sort of elastic that is used for catapults. Get a big glass bead, rather larger than the diameter of the pea-shooter, and thread the elastic through this, then pass the elastic right through the hole in the centre of the wood.

Now, at the other end, file two little notches in the pea-shooter as shown in picture 3. Then make a little handle out of a hairpin, bent as in picture 4, draw the elastic rather tight, hook it on to the handle as in 5, and then the mechanical part is done.

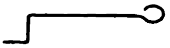
If you hold the propeller still and turn the handle at the other end, the elastic will be twisted up tightly. Then, when you release the propeller, it will buzz round quickly and, of course, when you put your ship in the water, it will drive it along.



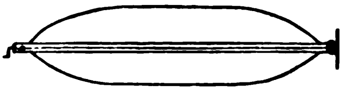
2. The propeller



3. The notched pea-shooter



4. The bent hairpin



5. A section showing how the elastic is threaded

But at present your boat will float. To overcome this you must get a piece of lead tubing. This should be beaten out flat and nailed along the wood to form a keel. It is of the right weight if, when you put your boat in the water, only just the top shows above the surface.

To make it dive you must nail "fins" to it. These fins are easily cut out of tin, and they must be put on with a slight tilt, as shown in picture 1. A straight "fin" at the bottom will make it complete. Now wind the elastic tightly, holding the propeller with the left hand. Then put the submarine boat in the water, still holding the propeller. Hold the boat steadily about a foot beneath the surface and then let the propeller go. At first your submarine will try to rise, but as it begins to travel faster the fins will keep it below the surface, and it will dart along through the water just like a fish.

If you want it to look particularly smart you can make a "conning tower" out of a piece of wood and fix it to the top.

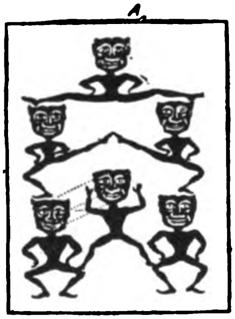
When you have tried it and made sure that it travels well, give it a coat of grey paint, and then it will look just like one of the real submarine boats of which you have heard so much.

If you use it in a pond you need never fear you will lose it, because it will stay under water only so long as the propeller is revolving. When the propeller stops the boat floats to the top of the pond.

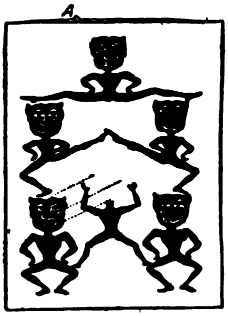
# THE IMP WITH A DISAPPEARING HEAD

THE apparatus for this trick consists of a card measuring about four inches by three inches, representing six little imps, as shown in picture 1.

You explain to the company that this card, which you carelessly show back and front, represents the celebrated troupe of Hikickalorum acrobats giving their marvellous performance. "You will notice their little feet," you may observe. "I will now show you their great feat, which you will find even more worthy of admiration. The two gentlemen in the middle row will kick off the head of the single gentleman just below them. If you have good sight, and watch them carefully, you will see their legs move."



1. First position of card



2. Second position of card

Holding the card between the second finger and the thumb, the picture side facing the company, you give it a quick wave from right to left and back again. The spectators will *not* see the legs move, though some of them will probably persuade themselves they did so; but, anyhow, there is "no deception" as to the main effect promised. The head of the figure indicated has miraculously vanished, and the picture appears now as shown in 2.

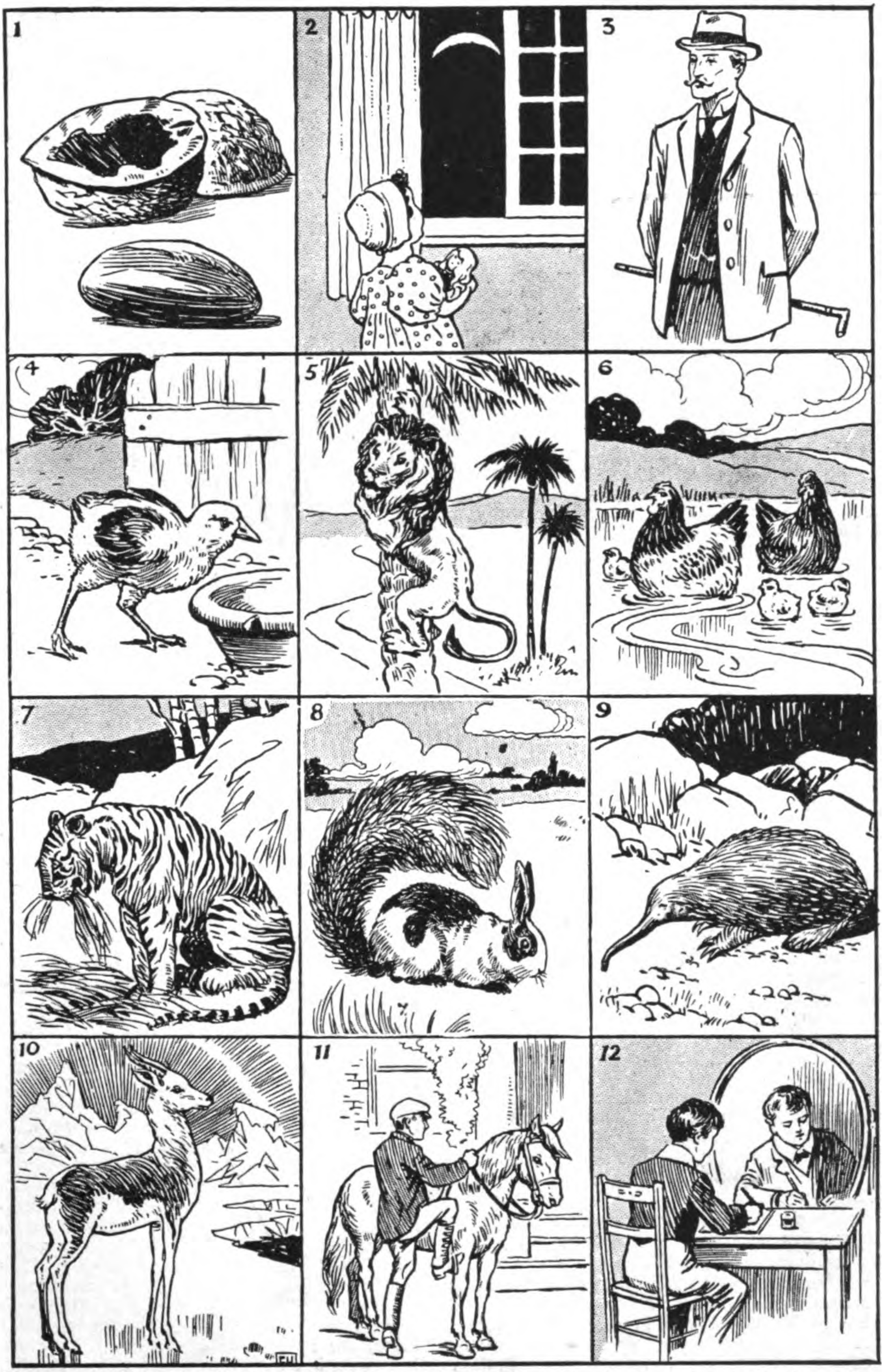
Of course, it would not do to leave the unfortunate imp in this headless condition. You explain that his head has been kicked up into the air, where it is still floating somewhere. "I will endeavour to catch it for him," you say, "or, rather, I will let the owner catch it for himself." Holding the card as before, you give it this time a quick up-and-down movement. If you are clever, the spectators have never lost sight of the figures, but somehow the head is back again as at first.

The picture, though it is to all appearance a simple piece of card, is in reality a very ingenious piece of mechanism. The supposed card is, in fact, two cards, joined together round the edges. Between them works a little lever of sheet brass, with its outer end projecting at the top of the picture, as shown at A. The "head" is movable, working on three bits of fine white horsehair, as indicated by the dotted lines. These are, by artificial light, imperceptible at a few feet distance. When A is as shown in picture 1, the head is in its normal position, but if A be pushed over as shown in picture 2, it is drawn over that of the imp in the lower left-hand corner, which it exactly covers, and so has apparently disappeared off the card.

The working of the trick will now scarcely need explanation. Under cover of the sideways movement the performer shifts the lever to the position shown in picture 2, and the head is gone. Under cover of the vertical movement he shifts it back again, and the head returns.

The cost of the card, from almost any conjuring shop, is not very great.

# WHAT IS WRONG IN THESE PICTURES?



There is something wrong in each of these pictures. It will help us to cultivate our powers of observation to try to discover the mistakes the artist has purposely made. They are pointed out on page 3518.

# CURIOUS THINGS ABOUT THE ALPHABET

When first we went to school and learned our A B C we did not think it at all interesting. But there are many things about the alphabet which are very curious and very interesting indeed. For instance, if we were given a set of A B C blocks, and were asked in how many different ways we could arrange them, we might, perhaps, say that we could place them in two or three hundred different ways. But if we said thousands, or even millions, we should be hopelessly underestimating the possible number of changes.

A great authority on the alphabet, Professor Max Müller, has pointed out that if we take only 24 letters, which is the number contained in the alphabets of many nations, these letters can be arranged in 620,448,401,733,239,439,360,000 different ways. It is, of course, quite impossible for us to grasp what these enormous figures mean, but let us put it in another way. Suppose we wanted to have all these different arrangements of the alphabet written out, and we set all the people of all the world to work, writing at the rate of forty pages a day, with forty sets of letters on each page, they could not complete the work in a thousand million years!

### AN ALPHABET WITH 214 LETTERS

The letters of the alphabet appear practically in the same order in nearly all languages, but how they came to be in this order nobody knows. The number of letters in the alphabets of different languages varies considerably. English and German have 26 letters; French, 25; Spanish, 27; Italian, 20; Russian, 36; Greek, 24; Latin and Hebrew, 22; Celtic, 17; Arabic, 28; Persian, 31; Turkish, 28; Sanskrit, 44; and Chinese most of all, 214.

Of course, in all languages the alphabet is imperfect, and various letters have to stand for more than one sound each. In our own English language, for instance, it is estimated that there are 42 sounds, and only 26 letters to represent them. Even then some of the letters, or signs, are only repetitions of others, as C, which could always be represented by either K or S. Ch, on the other hand, has no letter to represent its sound, which has nothing to do with C or H.

Referring to the myriad ways in which the letters of the alphabet may be transposed, all the words of all the languages, of course, consist of arrangements and rearrangements of a greater or smaller number of these few letters. Martin Luther tells us a story of a lazy monk who, instead of saying his prayers, used to repeat the alphabet and then ask that Providence would put the letters together to form suitable words.

### THE ALPHABET IN ONE VERSE

There is one verse in the Bible that contains all the letters of the alphabet except J, which was originally the same letter as I. It is found in Ezra vii., 21, and the little used letters X and Z are found in the names Artaxerxes and Ezra. Two English words contain all the vowels in the alphabet in their right order—facetious and abstemious. At least eighteen other words contain all the vowels, although in these they are not in their proper order: Authoritative, disadvantageous, encouraging, efficacious, instantaneous, importunate, mendacious, nefarious, objectionable, precarious, pertinacious, sacrilegious, simultaneous, tenacious, unintentional, unequivocal, undiscoverable, vexatious.

There is very much that is interesting about the separate letters of the alphabet. E has been described as

The beginning of eternity,
The end of time and space,
The beginning of every end,
And the end of every place.

### A BADLY TREATED LETTER

The letter H has always been a difficulty with English people without the advantages of education, and the Cockney habit of leaving it out when pronouncing words in which H should be sounded, and putting it in where it does not exist, has given rise to the following amusing protest of the letter H:

Whereas by you I have been driven
From 'ouse, from 'ome, from 'ope, from 'eaven,
And placed by your most learned society
In Hexile, Hanguish, and Hanxiety;
Nay, charged without one just pretence
With Harrogance and Himpudence;
I here demand full restitution,
And beg you'll mend your Hellocution.

The story is told of a little maid-of-all-work, that when asked by her mistress whether her name was Anna or Hannah, she replied, "Anna ma'am. Haitch, Ha, Hen, Hen, Ha, Haitch, 'Anna."

It is often asked why the letters M and N are used in the English Prayer-book in answer to the question "What is your name?" and in the marriage formula for publishing the banns. Some think the M stands for *Marius*, the Latin word for husband, and N for *Nupta*, bride; but this cannot be, as in the older Prayer-books N only is used and the M does not appear at all. It is probable that the N was originally adopted as meaning *Nomen*, the Latin word for name.

### "MIND YOUR P'S AND Q'S"

"Mind your p's and q's" is a very common expression, and has been said to refer to the old habit of chalking up the pints and quarts of refreshment which a man consumed at an inn, and paid for at the end of the week. But it is far more likely to be an expression that originated in printing offices, where, when letters are reversed, as they are in type, the small p's and q's are very liable to be mistaken for one another.

It has often been remarked that acrobats and circus-riders in taking professional names are very fond of adopting names that begin with Z. And yet the letter Z is very rarely found as the initial of a real surname. It is said that never within living memory has a member of the British House of Commons had a name beginning with Z. On the other hand, the Parliament of Victoria, Australia, has never been without such a name, Zincke, Zox, and Zeal being one or two examples.

# DOLLS OF MANY NATIONS

## PLAYMATES OF OTHER LANDS AND HOW TO DRESS THEM

We all know that our little friends in other lands do not dress as we do, and the coloured picture shows us the kind of clothes they wear. We should be able to tell whether a country were warm or cold if we saw the children dressed, because those who lived in the cold place would be well wrapped up in thick woollen cloth, while the children in the warm climate would wear thin muslin or cotton stuff, and very likely have bare feet.

In hot countries the sun is so strong that it scorches the skin, so we should find the children had very brown complexions—quite a deep, rich colour compared with those who live in colder climates. Generally speaking, in a hot country the hair of the people will be dark, while in a cooler atmosphere the people will be fair. For instance, in India they have black hair; while in Sweden and Norway most of them are fair, and have yellow hair.

There are differences in manners and customs as well as in faces and hair. In some countries the people are far more industrious than in others—generally in the colder ones.

Don't you know how you feel more inclined to work hard on a sharp frosty morning than on a hot August day? Well, the cold and hot climates have exactly the same effect on the people who live there.

We are going to suppose that we have twelve dolls, and that we want to dress each one to represent one of our little friends in other lands. First, we shall find out exactly how to dress a doll like a little French child.

### HENRIETTE—THE LITTLE FRENCH DOLL

French women are noted for their good taste in clothes, and the French girl always looks very neat, even if she is quite poor. The rich people like to dress their children elaborately; their little frocks are most beautifully made, and often cost a very great deal of money. So we must dress the French doll very daintily, using fine blue glacé silk for the dress, with plenty of lace on the underthings—very full petticoats, with frills and frills of lace, and lots of tucks, and everything to make it look "fussy," and very full all round the skirt. Notice the long bodice and very short skirt shown in the picture, also the sash of plaid silk, with fringed ends.

French children are very often dressed entirely in plaid, and always show their knees until they are quite tall.

Observe the white socks, patent-toed kid boots (either black or putty colour) buttoning up nearly to the top of the socks, and the smart little parasol. The hat is very full, and made of lace, with a blue bow to trim it.

The doll's name is Henriette, and she would wear tiny pearl beads round her neck, or perhaps a string of little pale pink corals. She would have a gold bangle, or perhaps two, on her arms, and a bow on her hair, of either black or pale blue silk ribbon.

We must choose a wax doll with a pale complexion and dark hair. In France it is the custom to allow the children to stay up late at night, often till the parents go to bed, so that we shall hardly ever find a child who has pretty rosy cheeks.

### GRETCHEN—THE LITTLE GERMAN DOLL

Now we will take a peep into Germany to try to find out what the little peasant children who live there are wearing. We shall have to go right out into the country to find a costume that differs from our own, for if we sought out the little girls and boys of Berlin and the other big German towns we should find them dressed very much like other children. Nevertheless, the peasant class differs very much, because it has a definite costume, which it wears both on work and fête days.

The most striking feature is the "Grannie" bonnet, with its straight front, quite stiff and plain, and full-pouched back. Look at Gretchen's picture, and you will see it. It would all be made of cotton stuff, but of two colours; the back part is white, and the stiff part which goes round the head pale blue, edged with a tiny frill of white.

When we dress our doll we must part her hair and plait it into two pigtails, fastened at the ends with small bows of red ribbon. Therefore, in choosing our doll, we must see that she has long, fair hair almost yellow in colour. She should have a plump little figure and a good, healthy colour.

The soft white lawn blouse is cut rather low in the neck. It is full, and pouches just a little over the top of the corselet belt which Gretchen wears. This is made of black velvet, and is a straight band in shape, supported by two bands going right over the shoulder. It is laced up behind.

The skirt is of cloth or cotton, and dark blue is a favourite colour. Make it full, and gather it into a plain band. It is put on after the blouse; and the corselet, which is a sort of waistbelt, fits neatly over the skirt-band.

The apron has no bib, but quite makes up for that by having *two* pockets—one on each side. It is made of white muslin, decorated with a frill at the bottom hem. Notice that this frill goes a little tiny way only up the sides of the apron.

The stockings are white, and the shoes either brown or black, with low heels, and of a wide, comfortable shape. The sleeves are small, finished by a small plain band which comes *just* to the elbow.

The doll's name is Gretchen, and if we liked we might let her hold a wooden hay-rake to show that she has been at work in the fields.

## GRETA—THE LITTLE SWEDISH DOLL

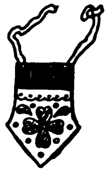
This time we are going to see how a little Swedish doll should be dressed. First of all, we must know that the climate of Sweden is much colder than ours. Though they do have warm weather in the summer-time, just as we do, it is generally much more snowy and icy in the winter. So that explains why they wear such thick stuffs and warm clothes. The girls and women are very industrious, and fond of fine needlework. They make most delightful embroideries for their houses, and decorate their own and their children's clothes with charming needlework in wools and silks. They make delicate little patterns on the children's caps and bonnets, and think nothing of embroidering a small coat *all over*—sleeves and back and front as well. Their table-linen and household things are always beautifully worked. When they go out to tea it is quite the custom to take some stitching with them. Some of us would be put to shame if we saw the large amount of beautiful work the Swedish children do.

When a girl is going to be married, sometimes her friends will arrange together to work a quilt for her. They collect small squares of plush or other rich material; each one takes a piece home, on which she embroiders very beautifully her own Christian name. Afterwards all the squares are sewn together, and the bride has a loving souvenir from all her girl friends.

Of course, there are different variations of this costume, peculiar to different parts of the country of Sweden. This has been chosen as being one of the prettiest.

This doll's name is Greta—pronounced just as it is spelt.

As the picture will show us, she wears a white shirt made of fine muslin gathered into a straight neckband; scarlet vest, buttoned together in front with gold buttons, made of red and black striped silk. A piece of red silk, with black lines made on it either with embroidery or braid, would give the right effect, if we are unable to get the right kind of silk. The kind known as English silk can often be bought striped alternately red and black, and it is quite cheap.



The pocket

The jacket is made of dark bluish-green cloth, and here comes in the embroidery, which goes all over it in a pattern composed of triangles and lines—not at all a difficult one to copy. It is worked in black wool, the triangles filled in, and the lines outlined. It will be found better to cut out the coat a plain, tight-fitting shape, embroider it, and then sew it together afterwards. It might be lined either with thin silk or muslin.

The skirt is full, made of black cloth, with a scarlet hem, also of cloth. The apron is dark blue, and not of cotton, as we have them, but of cloth. On the cloth is a pattern of fine white lines, which may be suggested by cotton threads run evenly through the surface of the cloth.

The pocket is the most fascinating detail. It is dark blue or red at the back, with a white front forming the pouch part, ornamented with pieces of the red cloth cut out in shapes sewn on with white thread; the stitches show and form white spots or crosses round the edge of the red shapes.

The cap is red satin, with yellow and blue flowers and leaves embroidered on it. It is in shape rather like our Puritan bonnets, but more open at the back, showing the hair well, and pointed in front.

The Swedish people are very fond of embroidery. Just notice how much there is on this one costume.

The shoes are black, with tongues and buckles, and the socks are white.

## FILOMENA—THE LITTLE ITALIAN DOLL

In beautiful Italy there are, of course, many classes of people, just as there are in our country, but it is only among the peasant class that we shall be able to find a typical or distinctive costume. The town folk dress much as we do. The dress we can see in the picture is one that would be worn by a little fisher girl. Her name is Filomena. We must try to buy a doll with dark hair and eyes and an olive-tinted complexion, because we have to represent a little girl who spends many hours of her time in the open air and bright sunshine. So she must have a brown skin, and a pretty pink colour in her cheeks.

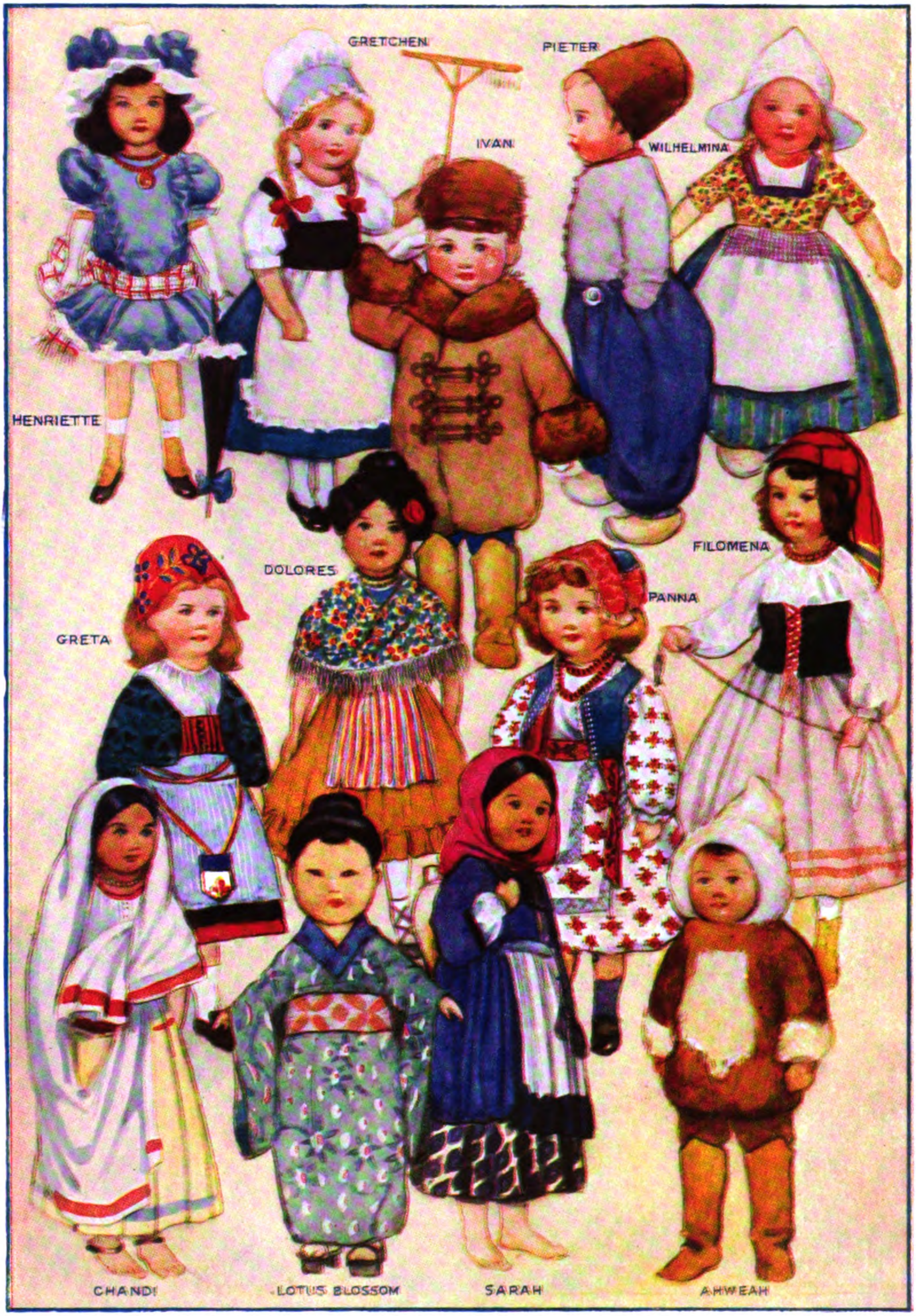
To describe the frock, we will start at the top with the head-dress, which is made of a square scarf, either white or any gay, light colour. We will choose red with an orange and blue border. It should be folded cornerwise, and placed on the head with the two corners which come together hanging down at the back, and the other two—which are folded in half—hanging at the sides. The side-pieces are then raised to the top and pinned there.

Next comes a pair of red coral ear-rings, and a coral necklace to match.

Filomena's blouse should be made of fine white lawn, made very simply, and gathered at the neck into a narrow band. The sleeves are long and full, and are finished with a narrow cuff. The skirt is made of the same material, trimmed at the hem with a couple of rows of bright scarlet braid. The skirt should be made full and loose.

The little corselets, which are quite a feature of all Italian peasant costumes, are made of black velvet, and drawn together with red laces. We shall not find these difficult to make. We should fit them to our doll, make a little seam down the centre, if necessary, stiffen them with lines of machine-stitching, so that they will keep quite firm, and work eyelet-holes to thread the laces through. The stockings are of white cotton, and the boots of untanned leather.

# SOME LITTLE DOLLS OF OTHER NATIONS



These are some of the interesting little nursery playmates of twelve other lands. The countries that these dolls come from are as follows

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Henriette | France | Ivan | Russia | Panna | Hungary | Lotus Blossom | Japan |
| Gretchen | Germany | Greta | Sweden | Filomena | Italy | Sarah | Armenia |
| Pieter & Wilhelmina | Holland | Dolores | Spain | Chandi | India | Ahweah | Eskimo |

We learn how to dress these pretty dolls in their own picturesque national costumes in the articles beginning on page 3391 of this book.

## DOLORES—THE LITTLE SPANISH DOLL

Spain is very often called Sunny Spain, because the climate is warm, bright, and full of sunshine. People who live in hot countries always love bright colours about them, in their houses and streets, and on their dresses, while people in colder places generally wear greys, black, and dark colours, so that we must find for our Spanish doll some very bright pieces of material. She will represent a dark girl, upright, and of graceful carriage. The women of Spain are noted for their beauty, and have dark, flashing eyes, so we must try to find a doll to fit these requirements. She must have plenty of dark hair, as it has to be " done up. '

This costume is one which would be worn on fête days and holidays by a girl from thirteen to fifteen years old. At other times the girls dress very much as we do. The most noticeable feature is the shawl, which is always brightly coloured, and has all round it a deep fringe, knotted at the edge and made of fine black silk.

We must get a square piece of soft silk, brightly coloured and patterned. For instance, an orange ground with red and green flowers on it, or a pink ground with a small pattern in purple, deep red, and blue would do. Sew the fine black silk fringe all round the edge, and the shawl is made. We must fold our shawl from corner to corner, and put it round the doll's shoulders, as shown in the picture, crossed in front, with the ends loosely tied behind. Notice at the same time that the fringe is a deep one in proportion to the size of the shawl; also that it is knotted at the edge joining the shawl.

The bare throat should be decorated with one or two rows of coloured beads.

The skirt is a shape such as we wear, made with a frill at the hem, and short enough to show the ankles. The frill should be put on in little box-pleats, as shown in the picture.

The stockings are white, the shoes black, held on by the pretty little cross gartering, which can be made of narrow black silk or velvet ribbon. Fix an end of the ribbon to each side of a shoe, bring the ribbon round, cross it in front, and tie as shown in the picture.

The cotton apron is striped in several colours—it might be blue, green and red, or perhaps a pink one with mauve stripes; certainly it would be very bright.

The hair, a very important item, must be dressed high up on top, and should have a very tall comb stuck in behind, which shows from the front. A rose of deep red or bright pink will be stuck in on the left side.

It will, perhaps, be impossible for us to get a back-comb in a size to fit the doll. As it is a very necessary feature of the costume, here is a suggestion. Get an ordinary back-comb with an inch-wide top and fine teeth—perhaps one somebody has discarded because a tooth has broken can be found. Combs can quite easily be cut with a sharp penknife, and the edge smoothed with sand-paper or a nail-file. So we shall not find it a hard task to make a back-comb to fit our doll.

Sometimes the Spanish girls wear a lace scarf to drape the hair; this is called a mantilla. It looks very charming indeed, but it is not usually worn with a fringed shawl; it accompanies a costume more like our own—that is, a dress with a bodice and skirt as we wear them. It takes the place of a hat, and is always worn at a bull-fight, the most popular entertainment in Spain.

## PANNA—THE LITTLE HUNGARIAN DOLL

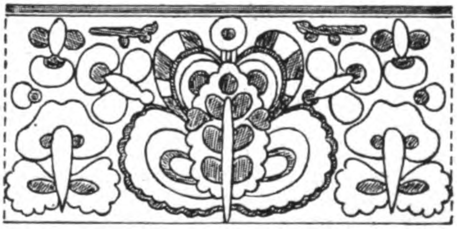
As in most other European countries, so in Austria and Hungary—it is only the peasants who still keep to their national dress. In Hungary they wear a costume like that of the little girl in the picture. It is very charming indeed, and belongs to the part of Hungary called Croatia. We will call our doll Panna. She will have a happy little round face, with a healthy colour, brown hair and laughing eyes.

Her cap, or bonnet, which we will describe first, is one of the prettiest head-dresses imaginable. It is made of hand-woven cotton or linen, white or cream, and embroidered very beautifully in the brightest red, green, and violet silk it is possible to buy. The shape of the cap is very simple, for it is only two straight pieces of material.

The embroidery on the frock and bonnet, of which we give a design on this page, must be copied as accurately as possible, because it is a very important feature of the costume.

The bonnet is worked in two shades of geranium-coloured red—a deep, bright scarlet and a very pinkish red. These are not colours which *we* should put together, but they are extremely becoming to the wearer. The dark parts in the design given are filled in with violet and a soft greyish green. The silk used is thick and bright. The background is filled in with red, so that no material shows between the pattern.

We must use the design once for the back piece, and repeat it twice for the front of the cap. Join up the pieces which we see on page 3394, where the letters coincide—A B on the back to A B on the front, and C D on the back to C D on the front. The little hole which is left is filled in with lace stitches, the effect being very like drawn-thread work.



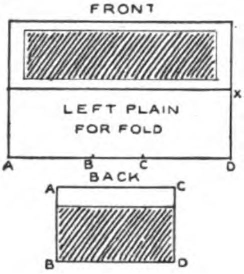
**The pattern for the embroidery**

The most curious part of the cap is the "fold." The part from X to D is doubled back, bringing the embroidered half of the front to meet the back of the bonnet, and hiding the plain half of the front altogether.

The lace at the edge is of woven brown thread, of a more or less unbleached colour, and it is put on just slightly full.

For the skirt and blouse white cotton is used, embroidered all over in a spot pattern. Cross-stitch is used, and the colours are black and red. Note well how the pattern is arranged in the picture, and also observe the shape of the skirt and blouse. The sleeve is finished with a frill at the wrist, and the skirt is just gathered into the waist.

The coat, which is quite plain in shape and without sleeves, is made of dark blue cloth lined with red silk. The edging is a strip of white cloth "pinked" out to form a border, and put on in between the lining and stuff, so that it stands out all round the edge of the coat. It only differs from the ordinary pinking which we have on our lamp-shades in the little hole in each point. The two rows of very tiny buttons are silver in colour, and very bright.



**The bonnet pattern**

The little apron matches the dress in colour and material, except the border which edges it, and appears again a few inches inside.

The sash is a woven wool, or cotton braid, in bright colours—we call it "galon."

Panna wears a necklace of big red and black beads, threaded alternately—first a red and then a black, and so on.

## SARAH—THE LITTLE ARMENIAN DOLL

The complexions of the Armenian people are olive, the hair black, the eyes dark, and the women are noted for their long lashes. Altogether they are considered a handsome race, though their features are large. Our picture shows a little Armenian girl whose duty it is to fetch water in the beautiful earthen pot which she slings over her shoulder by a cord—for there are no water-pipes in Armenia.

Her costume is of cotton stuff—it is hot in the country where she lives, so she will not dress in thick material; the skirt is full, and hangs in flutes all round. It is cut several inches off the ground in length, and shows her bare feet and ankles.

The stuff is beautifully patterned in rich colours in what we usually call the "pine pattern." The little bodice which joins the skirt (they are sewn together at the waist) is a plain, tight-fitting affair, with long sleeves coming to the wrist, where they fasten with a small, plain cuff. It has no collar, and it is fastened in front with a few buttons.

Over this she wears a coat made on the same principle as the costume. It has a full skirt joined to a plain top. The coat-skirt is shorter than the dress-skirt, and the coat-sleeves are short, coming to the elbow, and finish with a narrow frill of the material, which, by the way, is a dark blue or dark purple cotton.

Over the coat she wears an apron. There is plenty of stuff in the apron, but it is all gathered in so closely that it does not cover up much of the front of her dress. It is made of white cotton with a wide border of blue or patterned material.

The head-dress is very simple—just a brightly coloured handkerchief or square of cotton folded round the head.

## AHWEAH—THE LITTLE ESKIMO DOLL

We all know where the Eskimo people live—right up near the North Pole, where it is always cold, and the winters are long and dark. It will not take us long to guess, when we think of this, how these people are dressed. Of course they are wrapped up in fur, because there is nothing else in the world which keeps one so warm and cosy as fur does. The people are very strong and rather plump. They are decidedly small in stature, and have small hands and feet. Their complexions are swarthy—by that we mean, of course, that the skin is a pale yellowish brown—and they have broad, flat faces, with eyes that slant in a way that reminds one of the Japanese.

The most strange part about the Eskimo costume is that the men and women are dressed alike, both wearing trousers, boots, and gaiters. The only difference is that sometimes the lady wears a few beads.

The garments themselves are quite plain in shape, and the only ornamentation is a white skin sewn into the middle of the front. A pointed piece of fur, either cut from the tail or head of the animal, makes a sort of little tab or finish at the bottom of the front of the coat. The cuffs are white, too, to match the front piece.

The hood is a warm, tight-fitting one, coming closely round the face, and it has a little point sticking up behind.

The little girl shown in the picture, whose name is Ahweah, wears, of course, trousers to keep the cold from her legs. They are stuffed inside the top-boots, which are made of leather, with good stout soles to keep the wet out. The gloves are of leather, too, and have a thumb-piece only, like a baby's gloves.

Her hair, which is jet black and very straight, is plaited into two tails as soon as it is long enough. In the front it just hangs in little straight pieces over the forehead, and is decidedly irregular in length. The Eskimo boy has his hair cut off in a straight line across his forehead, a short distance above his eyebrows, but the back grows long just as his sister's does.

## LITTLE DUTCH DOLLS—PIETER AND WILHELMINA

Before we begin to dress these dolls we must look at the picture very closely. We will begin with the boy doll. This costume is very easy to make, because it is a very simple one, both loose and comfortable as well as warm. We shall see that he has extremely baggy trousers, reaching to the ankles. These should be made of dark blue cloth, and cut very full indeed. His coat is of dark grey cloth, buttoned up to the neck. Underneath is a red striped waistcoat, the collar of which can be seen just peeping above the coat. At the waist are worn two silver buttons, always as big as can possibly be afforded. Sometimes they are like small saucers, and stretch right across the body, but most little boys can only get them the size of a half-dollar.

At the throat the red waistcoat is fastened with two gold-coloured buttons, and the buttons which fasten the coat are of silver. The buttons of a Dutch boy are his jewellery, and a very important thing with him.

Pieter's hat is a felt or cloth one, round in shape and fairly tall, but with no brim. This must be made to fit his head. Cut a small circle of cloth for the crown, and to this join a straight piece—that is, a strip *as long as the circle is round*. Then make the join as invisible as possible, and the cap is complete. These hats are like a thimble in shape, tapering a little towards the top.

The wooden shoes—sabots, they call them—can be made out of thin cardboard or canvas, glued together, if we cannot find a pair of real wooden doll's sabots. They are often to be found for sale in toy-shops, however, and are quite cheap.

Pieter must, of course, be a boy doll, with short, *straight* hair. He is fair, and has a healthy, "fresh-air" complexion.

The little Dutch girl's cap is made of white lace or embroidered muslin. It fits tightly to the head, and has wide side-pieces, which turn back from the face and form flaps, or "wings." These caps are stiffly starched to make the wings stand out, so we must make ours of stiff muslin. If we use lace, we shall have to insert a fine wire at the edge.

The bodice is tight-fitting, with elbow-sleeves. The square vest in front has an inner chemisette of white, and is bordered with a band of plain or differently coloured material from that of the bodice itself, which is a patterned cotton. Round her throat the Dutch girl wears a handsome necklace of corals, several rows held together in front by a large gold clasp.

While in America the women try to look slim, the Dutch lady, to be really well dressed, must look as big as possible. She must try to appear quite fat, and the more woollen petticoats she wears the better! It is the fashion in Holland to have a lot of petticoats. The skirts only come to the ankle, and the petticoats are cut the same length, so that when she walks the Dutch girl swings her skirts to and fro, and the petticoats can be seen. The richer the lady the more petticoats she wears. Therefore, we must make our doll plenty of thick petticoats and a dark cloth skirt. Make them all very full, gathered in all round the waist.

The apron, which should be white or blue, has a piece of check material at the top. We can see how this is done in the picture. Notice that there is no bib as we have, and that the fastening is a plain band, very narrow, buttoning at the back. The sabots are the same as the boy's, and an American doll, either dark or fair, will represent Wilhelmina.

We should remember that there are very many different kinds and colours of costumes in Holland, some, of course, much more elaborate than these, but they all bear a "family likeness" to the Dutch costumes described here.

The Dutch people wear, perhaps, the quaintest and prettiest costumes of any.

## IVAN—THE LITTLE RUSSIAN DOLL

Russia is such a large country that in different parts of it the climate varies from quite hot to quite cold. On the whole, however, it is considered a cold country, and in St. Petersburg, the capital, they have very severe winters; they are so cold that the river freezes over until the ice is strong enough to bear the weight of horses and carts. Then people bring out their sleighs and carts specially fitted with flat pieces of steel, like huge skates, instead of wheels. These glide along the ice road made by the frozen river, going along at a tremendous speed.

It is easy to understand that people need very warm clothes for these ice journeys; in fact, everyone who can possibly afford it wears furs.

Not only is the hair of the fur warm, but the leather from which it grows also keeps out the cold. And so we are going to dress little Ivan in fur.

We must get a little boy doll, with short hair; in fact, just like a little American boy in hair and complexion. First of all he will wear a navy blue sailor suit, like those our boys have, but he will wear top-boots with it.

We shall be able to make these out of a piece of soft kid or leather. Notice the shape of them.

Next we come to the overcoat, which is like ours in shape, but lined and trimmed with fur. The fastenings are "froggings" of black woollen braid, and arranged as shown in the picture. Any dark thick cloth will be suitable for the coat. The collar and cuffs are made of long fur, and the lining of a shorter kind.

The little cap, round in shape, fits closely to the head, and is made of fur to match the collar and cuffs.

Little Ivan's costume would not be complete without gloves; in such a cold climate the hands must always be carefully protected.

## LOTUS BLOSSOM—THE LITTLE JAPANESE DOLL

THE costume worn by the little Japanese girl is one of the most beautiful in the world. The Japanese are great artists; they are wonderful at making exquisite objects out of simple, cheap material. They excel in this point, and we find the idea carried out in their garments. They have, too, a great love of colour, and, by some instinct, they seem to know how to blend colours in a most wonderful way. So that we shall find their clothes simple in shape, made from almost straight pieces of material—and not much of it. We shall also find the colours very beautiful and well arranged.

Now we will find out how to make a costume for Lotus Blossom, which is the English translation of a real Japanese girl's name.

The Japs are passionately fond of flowers; they give the children flower names, and also dress them in material with flowers upon it.

It is quite easy to buy Japanese printed cotton at any large drapery warehouse. We must be sure that it is real, and not an English imitation, for there is a great deal of difference. The price will be less than a quarter a yard.

Perhaps at the same shop we shall be able to buy a Japanese doll, with almond eyes and black hair.

The shape of the dress is very simple—very much like our dressing-gowns, though the sleeves are different. They are long and straight in shape, and have deep pockets in the end which hangs down. The little owner keeps all sorts of things in here beside her handkerchief.

Let us suppose that we have bought a pale green material with branches of flowers, pink, purple, and grey, trailing across it, and here and there lines of black and gold.

A little fold of purple silk—a slightly deeper shade than the flowers—will just show where the gown crosses at the neck. For the sash we must get a piece of stiffer material—Japanese brocade or gold tissue.

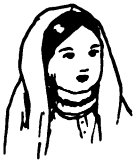
The Japanese girl thinks a great deal of her sash, and is very particular about the way it is tied behind. It should be very wide in front, folded at the back with one loop going up and another going down, threaded through a crossway piece.

Lotus Blossom wears wooden shoes with short stilts that fit into holes in the bottom. She fixes in these stilts during rainy weather to keep her feet off the wet ground.

To dress the hair of a fashionable girl generally takes about two hours—never less, and often longer; it is not surprising, therefore, that the hair-dressing is expected to last for two or three days!

A great variety of combs is used, and plenty of pomade to form the hair into shapes before it is finally fixed. A Japanese girl does not wear a hat in the street—she carries a paper sunshade. We can buy one (doll's size) at a toy-shop.

## CHANDI—THE LITTLE INDIAN DOLL



IN our collection of dolls we must certainly have one to represent India. Among the natives of that country we should find a great many different kinds of costume. The class distinctions are very great, and the costumes of each class vary more or less. In our picture we see a nurse-girl, or ayah, as she is called. Her name is Chandi. We see that she has bare feet. She would not wear shoes in the house—that would be considered very rude to her mistress. Just in the same way that an American lifts his hat here, an Indian removes his shoes before entering a house. When in the street Chandi would wear a pair of loose, heelless slippers, made of goat-hide, with turn-up toes and no fastening.

The dress is made of woven cotton material, yellowish in tint and soft in texture. The bodice is like a tunic in shape; it hangs outside the skirt, and comes three or four inches below the waist-line.

It is plain in shape, buttoning up in front with three sets of small buttons, each set containing two buttons.

On the hips at each side the bodice is cut up a little way, and a small piece of the material is inserted to make the garment fuller. The sleeves are plain and fit tightly to the arm, coming only to the elbow. A piping of scarlet cotton edges the neck, the sleeve, and the bottom of the bodice. The Indian woman is exceedingly fond of decorating her costume with a piping of bright colour.

The skirt is made of the same material. It is cut very full and pleated into the waist with a great many pleats; it is cut short enough to show the ankles.

The rest of the costume is composed of a strip of material bordered with a band of scarlet. This piece is draped round the figure and over the head, taking the place of a cloak and hat. To arrange the drapery we must start by tucking one end in at the waist in front; then we must twist it round over the back of the head, and bring the other end over the left shoulder. The ayah holds this in position with her hand as she walks.

She wears many metal bracelets, and on each foot is a metal anklet, one inch wide; they clank together as she walks. A similar piece of jewellery clasps her neck—fastened as old-fashioned bracelets were, with a hinge and a snap at opposite sides of the circle. Her next piece of jewellery is quite easy to make. It consists of very large ear-rings, made of clay or mud, which, while soft, has had stuck into it a number of brightly coloured beads, laid in a pattern composed of either circles or diamond shapes. These ear-rings are so heavy that they are supported by a chain which goes right round the ear.

Chandi's hair is black and very shiny, and is quite straight. It is parted in front and brushed down behind the ears, to be fastened, without hairpins, in a tight knob at the nape of the neck. Her complexion is deep brown all over and her eyes are dark.

# WHAT TO DO IN TROUBLE

## DUST OR GRIT IN THE EYE

When a little speck of grit or dust gets into the eye and no one is at hand to take it out for us, there are several things we can do. If we feel that the speck is moving about, we can first try shutting the eye a minute. Violent blowing of the nose will sometimes bring the speck out; so will tears. We might take hold of the upper lid with the thumb and forefinger and work it gently over the eye towards the nose. If the speck gets fixed on the surface of the eyeball we can dislodge it in this way, or by passing a moistened fine camel-hair brush or the corner of a handkerchief over the surface of the eye, using a looking-glass, of course. Bathing the eye with cold water, and opening it in cold water will take down the inflammation; so will a cold-water compress. If a spark from a cigar or a piece of hot ash enters the eye, a drop of olive or castor oil will ease the pain. It is bad to rub the eye

## SOMETHING IN THE EAR

When by accident an insect flies into our ear we should try to coax it out by turning the ear towards a bright light. So if a bead or hard substance gets in, we risk destroying the drum by poking the bead against it. If we pour water in to try to wash a pea or other seed out, we might simply make it swell in the ear. The proper thing to do is to hold the ear downwards and gently pull at the lobe. If that fails, we must get someone to syringe the ear, or go to a doctor.

## TO STOP THE NOSE BLEEDING

If the bleeding is only slight, we can sniff cold water up the nose, apply a handkerchief dipped in cold water to the root of the nose, sit in a chair with the head back, and place a key or a piece of steel at the back of the neck. We should *not* bend down over a basin. If the bleeding is in a constant stream we should send for ice, lie flat, and plug the nostril with a screw of wet rag, until a doctor comes. The collar should be loosened, the hands held above the head, fresh air breathed, and a hot-water bottle applied to the feet.

## HOW TO TREAT BRUISES

A blow or a tumble may cause a painful and unsightly bruise, which hurts much at the time and turns purple, black, greenish, and yellow, due to bleeding underneath the skin. One remedy is to apply something cold, whether it be ice, the blade of a table-knife, or a cold-water bandage. A bruised limb should be rested. Arnica and water—one teaspoonful of arnica to a teacupful of water—are soothing when the skin is unbroken; when it is broken, calendula is applied, but the surface must first be washed free from dust or gravel. Should it be much grazed, it must be bound with a clean handkerchief to exclude the air. Sometimes bathing with very hot water gives quickest relief.

## STRAINS AND SPRAINS

We "strain" the wrist when we overstretch its tendons or muscles. We "sprain" the ankle or "go over" it when we stretch or tear the ligaments of the joints in that part of the foot. A sprained ankle may disable us for months, and it is unwise to try to walk with it before it is completely cured.

Hot fomentations should be applied to cure a strain or sprain—that is, we lay on the part a cloth dipped in water as hot as we can stand; then we apply a cold-water compress covered with oil-silk and bandaged with gauze in the proper way, and rest it.

## WHEN A BONE IS BROKEN

If the bone of a limb be broken, the limb is powerless. Should this happen to the leg, we must not try to move it, but wait till someone comes to lift us on to a stretcher, shutter or door. In doing this a rug or sheet should be carefully passed under the legs and these raised and lowered on to it. The injured limb can be lightly tied to a stick or umbrella which may be at hand, to give it support and prevent the broken bone piercing the skin. When the arm is broken a sling should be made for it out of a large pocket-handkerchief. We can feel along the broken bone and keep the two edges as near as possible together.

## BITES AND STINGS

If an unhealthy cat, dog, or any other animal, bites us, its saliva may poison our blood, especially if the bite is taken on a part unprotected by clothing. If the finger is bitten, we must at once bind it tightly higher up towards the hand, then suck the bite and spit out the saliva. As soon as we can get warm water we wash the wound; if it bleeds, all the better. Then we get it cauterised; a burning fusee has done duty when proper cauterising was impossible. The bites of insects are relieved by applying liquid ammonia or rubbing with a lump of moistened washing soda.

The sting of the bee can be removed by squeezing the part, or pressing a ring on to the surface, to force the sting out.

## THORNS IN THE FINGERS

If we cannot seize the splinter or thorn with the thumb and finger of the other hand or with a pair of tweezers, we must get a fine needle—a *needle*, not a pin—and tear open the skin in the direction the thorn entered. Then we stroke it along with the needle towards the opening, squeezing the finger towards the same point now and then, and also sucking it to draw out the thorn.

## FALLING INTO WATER

If we tumble into a river, lake or sea, the worst thing we can do is to throw up our arms, try to breathe under water, and struggle and scream away all our strength. If we cannot swim we can at least keep our presence of mind and remember that water will float us if we lie quietly on our backs. So we lie flat with the hands down and call for help. If a rope is thrown or a stick held out to us we seize that and are drawn to shore, but if someone swims to the rescue we must be careful not to grip that person round the neck, shoulders or waist, and drag him down under water.

# A LITTLE VEGETABLE GARDEN

## WHAT TO DO AT THE END OF MAY

It may be that tomatoes are among the things that we have set our hearts on growing. For inexperienced young gardeners the best way to proceed is not to attempt to rear the plants from seed, but to buy a few young plants—a quarter will probably buy more than we need—and they should be ready to plant in the open after a few days' hardening off. This process is very necessary, as they will have been grown under glass. We will stand the pots a few days in the open, and protect them at night if the weather be unfavourable. After that we must choose a warm, sunny position, and there is nothing better than the foot of a wall looking south. The soil should have been well dug and a little stable manure put at the bottom of each hole, then a layer of soil above it. The hole should be large enough to take the roots quite comfortably.

The usual plan nowadays is to grow only one stem, and even from this the side shoots must be pinched out. The young plants for a time should be watered in the morning rather than the evening, but too much water should not be given, or it may happen that we get luxuriant foliage and not so much blossom as we desire. All the same, the plants must never suffer for lack of water. If the little gardens are full already, or there is no favourable position for the plants, good specimens may be grown in large pots, in boxes, or in lard-tubs.

Soot-water is excellent to use sometimes in turn with clear water and manure-water for our plants. It may be helpful to know how to prepare it. We want some large tub or other vessel, and we tie up our soot in a bag of some coarse material. Lay a thick stick across the top of the vessel, and with a bit of strong string suspend the bag so that it is below the surface of the water. If the water is very deeply coloured we can add some clear water before using, for it must not be used too strong.

It is difficult to give the exact date when to transplant young greens from the seed-bed, so we will say when they are about three inches high. Perhaps we are hoping to grow them on the ground now occupied by the early potatoes. In that case there is some time to wait, for the potatoes are not yet ready to be lifted; but, rather than let the little broccoli and other greens be closely crowded together, we may prick them out a few inches apart on some small bit of spare space, and plant them again to the proper distance apart as the ground becomes vacant.

Do not let us forget what has already been said as to growing lettuces successfully—they must never lack moisture.

The summer is the time for shows and exhibitions, and if we want to exhibit we must prepare for it a long while beforehand by seeing that our vegetables have especial attention. In arranging a dish, let us say, of potatoes it will not answer to pick one, two, or three very large specimens, and the rest very much smaller. We ought to aim at a uniform size, as far as possible—a good even lot—and this applies, of course, to most of the subjects. Suppose we are arranging a basket of vegetables, then let us use plenty of parsley as a background; it helps to make the vegetables look inviting and tasteful.

We may plant out the half-hardy annuals that we have been rearing in boxes, or may choose to buy at this season. In fact, the last week in May is the time when we should fill all vacant places in the flower-beds with plants to make our garden bright and beautiful during summer. In some cold districts cannas, begonias, and dahlias that have been started under glass are generally not trusted to the open until the first week in June.

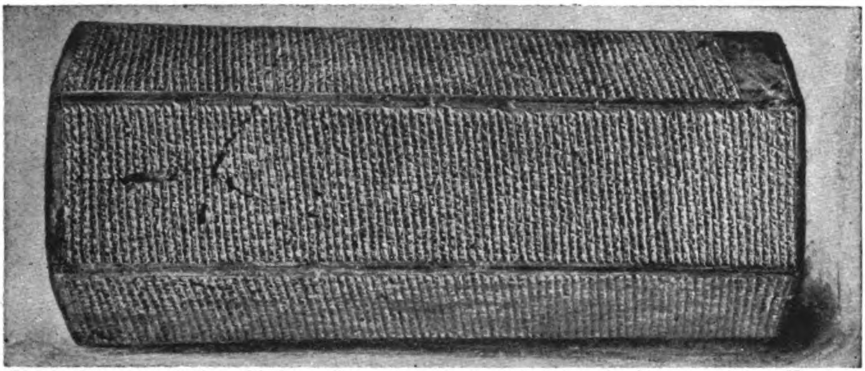
After everything is in place for the summer it is rather a good plan, if needed, to put a little clean, fresh gravel along our garden path, and to see that the edging, whatever it be—box, or stones, or tiles—is quite trim.

Now that the spring flowers are over it is a good thing to remember that plants are weakened if we let them ripen their seeds, so these should be cut off at an early stage. We may sow the seeds of wallflower for next year at any time from now onwards.

## ANSWERS TO THE PICTURE PUZZLES ON PAGE 3282

1. The nut-crackers are on the grapes, and the grape-scissors are among the nuts.
2. The handle of the pump is on the left instead of on the right of the spout.
3. The positions of the knife and fork, in relation to the plate on the table, are reversed.
4. These scissors have no centre-screw to join the two parts together, and act as a pivot.
5. The handle of this railway-carriage door is on the side next to the hinges.
6. The flag is waving against the wind, the direction of which is shown by the driving clouds and the bending trees in the distance.
7. The trigger of the revolver is the wrong way round.
8. The rose is growing on a vine tendril, as is shown by the shape of the leaves.
9. The football-player is playing the Rugby game with a round Association ball. In Association, the players are not allowed to handle the ball; the Rugby ball is of an oval shape.
10. The sword which the warrior wears is buckled on to his right side, whence it would be difficult to draw it with his right hand.
11. The train is running past its signal, which is set at danger.
12. The horn of this motor-car is out of easy reach of the driver.
13. The hour of four on most watches is indicated by the old sign IIII., instead of IV.
14. This motor-van has no number at the rear, as required by the law of the land.
15. These two trains are running side by side, though there is only a double set of rails.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 3511



This curious clay cylinder, with dents all over, is really an ancient Assyrian history book from Nineveh.

# HOW MEN LEARNED TO WRITE

CONTINUED FROM 3325

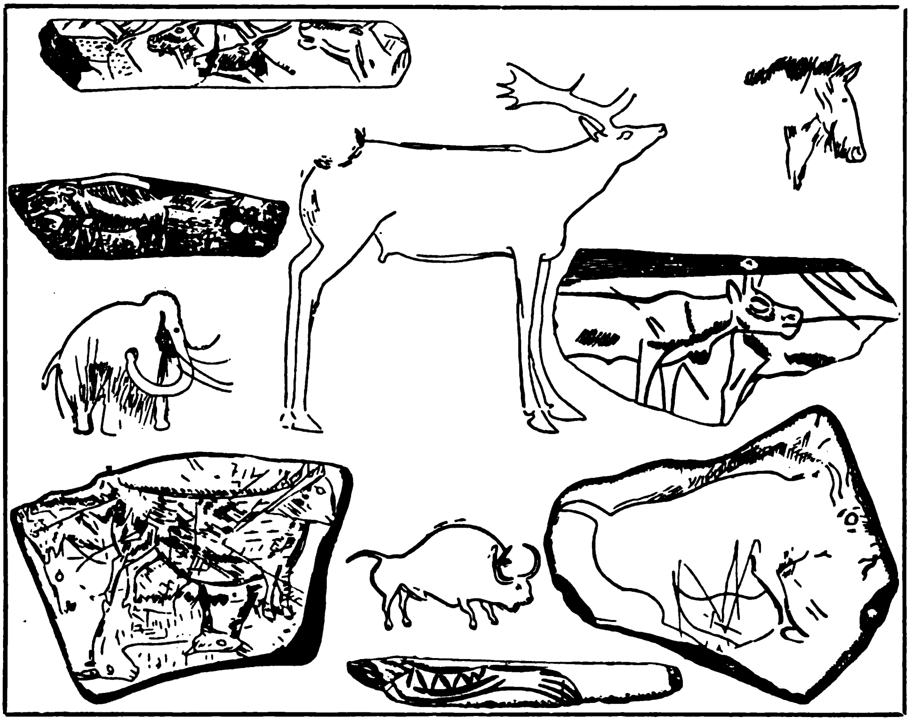
"PUT this letter in the oven to bake, please." It would sound funny to hear that said to-day, would it not ? But that is what people would hear when writing was in its infancy. Thousands of years ago the people of Babylonia and Egypt learned to make themselves understood in writing. They invented signs which stood for letters and words and ideas. These signs were sometimes pictures. A picture might stand for a letter, or for a name, or an article, or for something more. They had to learn to read and write just as we have to. But our manner of reading and writing is a thousand times better than theirs, which was the beginning of all reading and writing.

They had no pens or paper. The Babylonians took soft clay and shaped it into little bricks or tablets. On this they would write what they wished to say, using something which might be a piece of a broken pot, or part of an oyster shell, or something with a square head which would make their wedge-shaped outlines. These characters were impressed upon the soft clay, which was then placed in an oven to bake hard, or left in the sun to dry. They made their books and letters just like they made their bricks. Men who have dug up ruins in our own time have found old tablets of clay which record business matters that took place nearly 2,500 years before the birth of Christ.

For more lasting work, like the recording of laws, they used metal instruments, and with these carved their words on pillars of stone. One of the most wonderful codes of laws in the world—the code of Hammurabi, the great king of Babylon, who reigned more than 2,000 years before Christ—was written on a pillar of rock eight feet high. The laws were carved so perfectly on it that we are able, more than forty centuries later, to read them.

The Egyptians first wrote on stone, but other men of the same nation found that papyrus, a plant growing in the valley of the river Nile, made a good substance on which to write. They used to scratch the letters on with something very much like a pencil, or, better still, write with pen and ink. The ink was generally made from gall-nuts and sulphate of iron. The pens they made by cutting reeds, as we used to cut feathers and make them into quill pens. From Egypt the use of papyrus and reeds spread, by way of Greece, into Europe, and for hundreds and hundreds of years these were the principal substances for writing. But when the followers of Mohammed conquered Egypt, Europeans could not get papyrus, so they had to use a fine leather made smooth on both sides. This sort of leather is still used. We call it parchment. Vellum is another sort of parchment, but it is made from the leather of younger animals. The Romans used to write on blocks of wood which were covered with wax, on which they could print their letters with a hard point. Nowadays we in this country use the Roman alphabet, but not the Roman way of writing.

The reed pen is still largely used in the East, and it was used in the Western world until the thirteenth century, when quill pens, made from feathers, took its place. The quill lasted until about 1800, when metal pens began to appear on the market. They had been made before, but only as curiosities. Even at the beginning of the nineteenth century they were not soon successful.



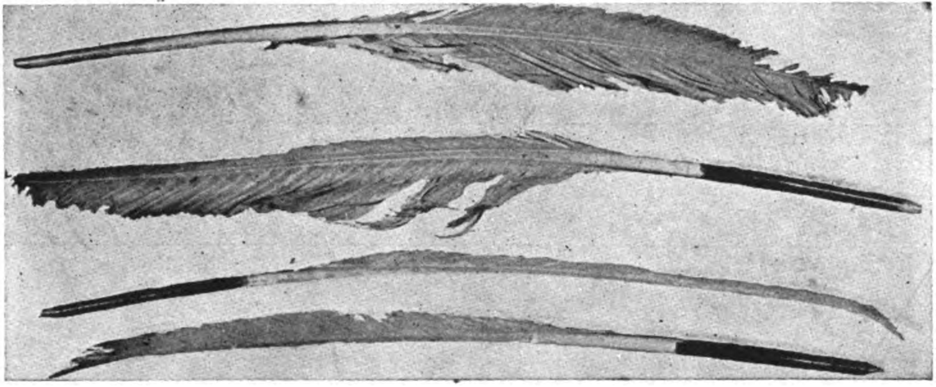
These pictures show how the earliest men used to write. They were scratched on bone or rock by prehistoric men, and most of the pictures were found in caves. From pictures, men developed signs for words and letters.

People tried to make pens of horn and of tortoiseshell, with pieces of diamond embedded in their points. They also put metal points to quill pens. Nothing much happened until 1820, when James Perry began metal pen making at Manchester, England. He was successful, but Sir Josiah Mason was still more so, for he invented a machine which would make metal pens so quickly and cheaply that everybody could obtain them.

Until after 1840 even school children used quills, but to-day there are more than 100,000 sorts and sizes of metal pens to choose from. The ordinary pen looks simple enough, but it has to go through sixteen processes before it is finished, while the gold nibs for fountain-pens are not finished till they have been through over forty processes.

Pencils came into use some hundreds of years ago, for they are mentioned in a book which was published in 1565. They are not so important for records as pens, because the lead rubs out. That is the very fact which made them important for the purpose for which they were needed. Ink cannot be rubbed out, in the ordinary sense. Where it may be necessary several times to rub out words, or figures, or lines, especially in drawings, pencil is the very thing required. Would not the ancient Britons, who made their drawings by scratching with flints on the rocks, have liked lead pencil with which to make rough sketches before leaving their work to be seen by generations several thousands of years after them?

# MAKING PENS FROM A BIRD'S FEATHERS



**For about 1,200 years before the 19th century, quill pens, made from the feathers of the goose, swan, or turkey, were universally used; and millions of quill pens are still made in England for use in offices and courts of law.**

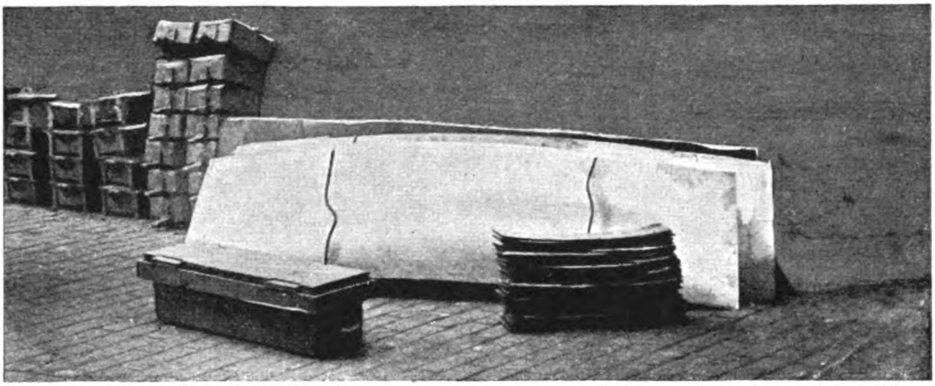
**The first process in making quill pens is to harden the quills by heating them in a vessel as the man in this picture is doing.**

**They are then carefully examined by an expert workman, and those suitable for the purpose for which they are intended are put together, ready for the cutter, who shapes the nib.**

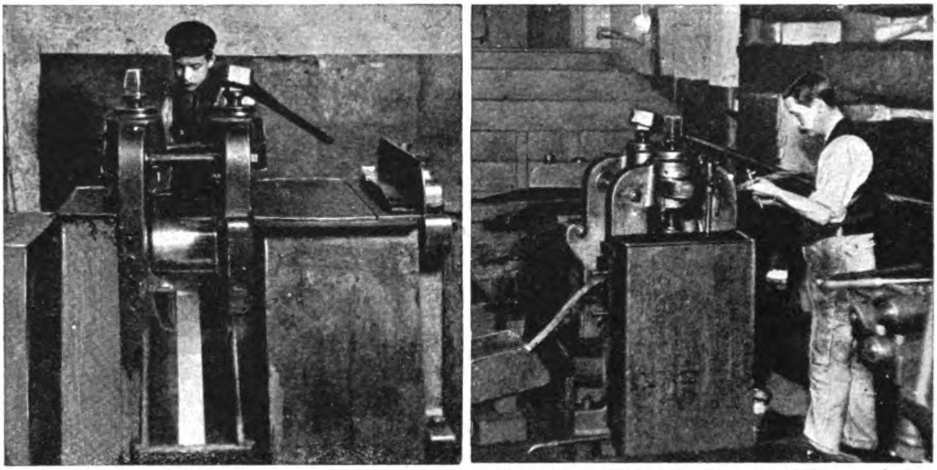
**The cutter with a few strokes of his knife produces the finished pen. Men who do this work are very skilful and quick, and make hundreds of pens, in a very short time, without spoiling any.**

**The quill pens are then tied together in bundles, ready for the shops. Of course the industry is declining every year.**

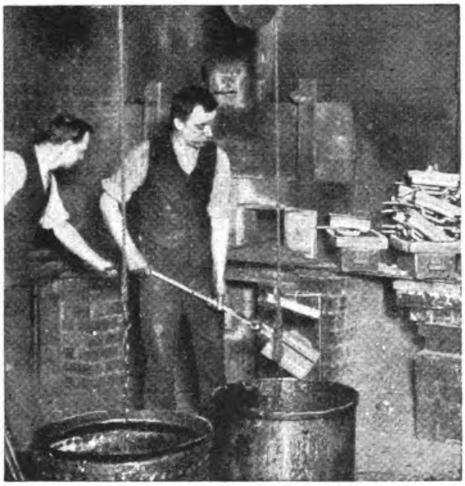
# HOW STEEL PENS AND NIBS ARE MADE



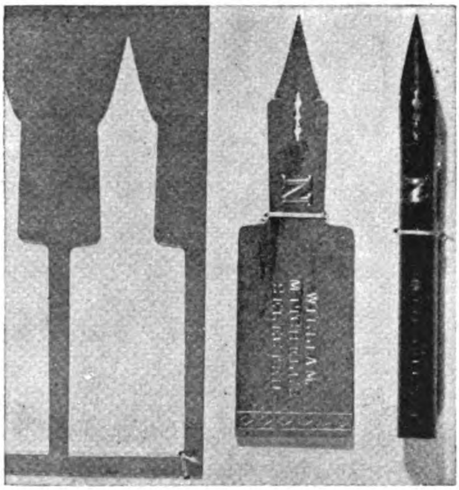
Steel pens go through sixteen processes, some of which are shown on this page. Here we see the steel from which the pens are made, and the annealing pots, or boxes in which strips of the metal are heated and softened.



In these pictures we see the strips of steel being rolled, in readiness for the stamping out of the pen shapes. This rolling process makes the strips of steel uniform in thickness to the ten-thousandth part of an inch.

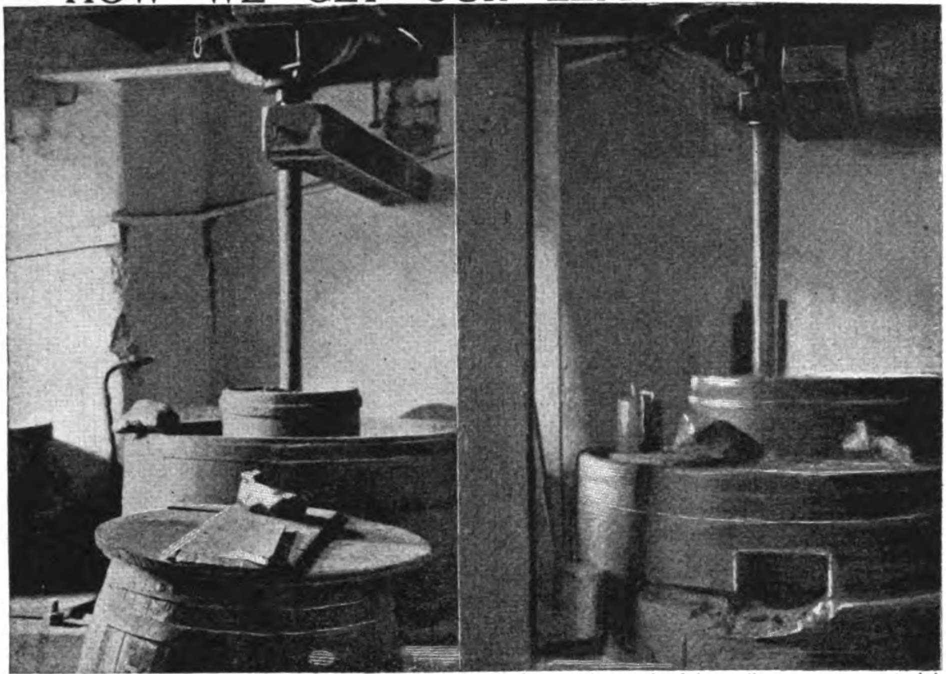


**The shapes are stamped out, heated in furnaces, and then put into vats of oil to harden them. as shown here.**

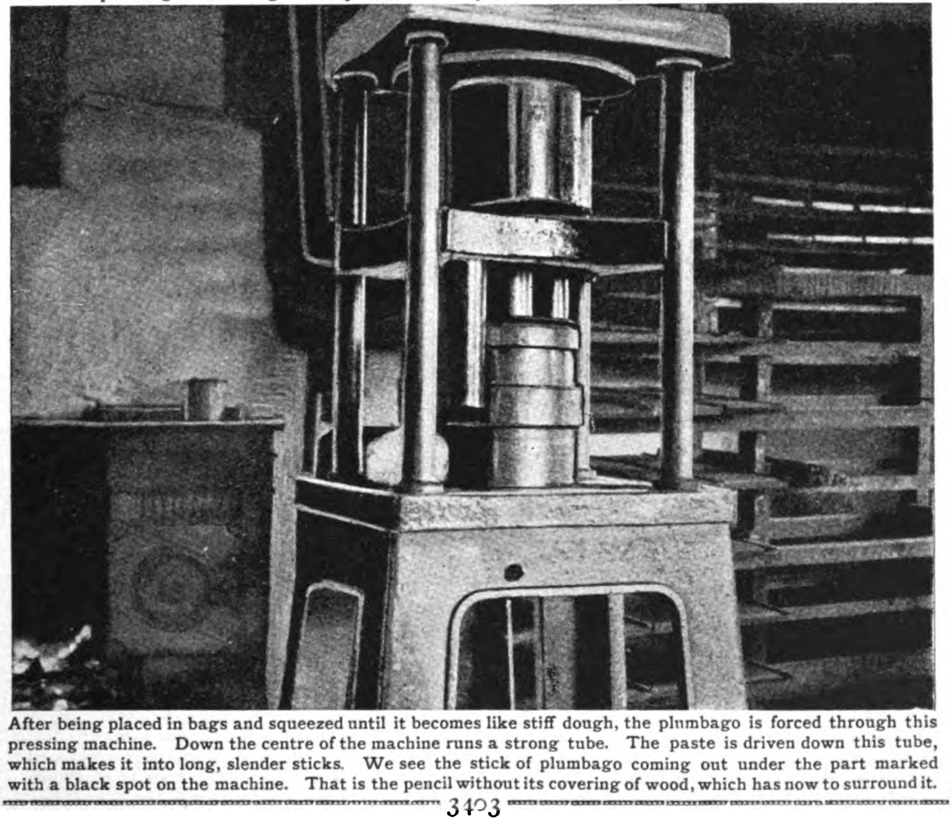


**Here we see the metal, and the shape stamped from it. The pen, quite ready for use, is shown on the right.**

# HOW WE GET OUR LEAD PENCILS



A lead pencil, which we stupidly call by that name though it contains no lead, is really made of a material called graphite, or plumbago. This is dug out of the earth, and consists of carbon and other things, but not of lead. The plumbago has to be ground up fine in these presses and the powder mixed with water and clay.



After being placed in bags and squeezed until it becomes like stiff dough, the plumbago is forced through this pressing machine. Down the centre of the machine runs a strong tube. The paste is driven down this tube, which makes it into long, slender sticks. We see the stick of plumbago coming out under the part marked with a black spot on the machine. That is the pencil without its covering of wood, which has now to surround it.

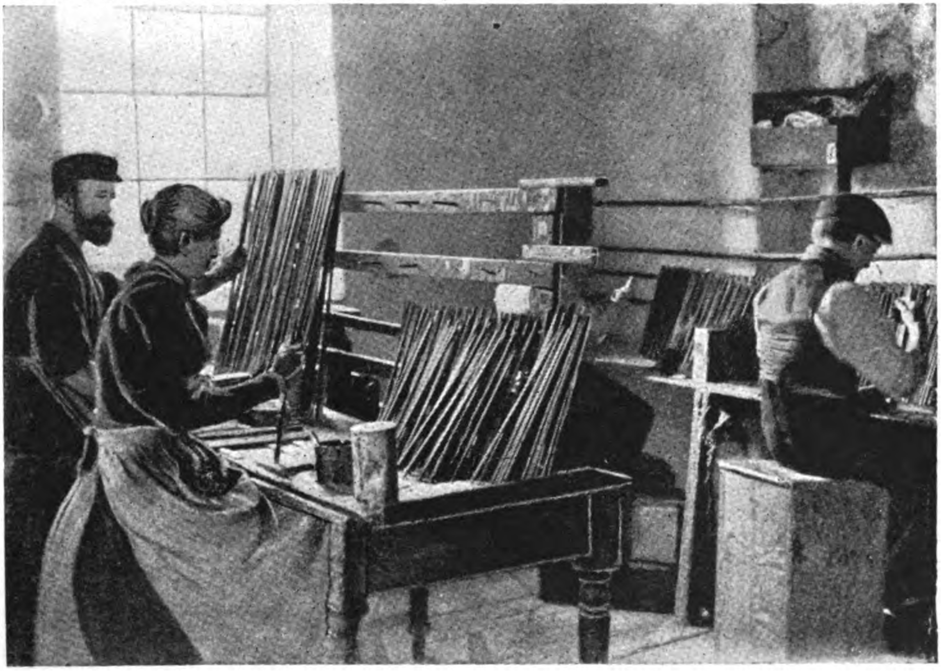
# THE PENCIL IS PUT INTO ITS CRADLE

The wood for the pencil is from the Virginia or Florida cedar-tree, which is soft, has a straight grain, and is easily cut. The tree is cut up into logs, and then taken to the factories. The logs are split into smaller pieces, and then a machine cuts these into long, straight, square strips of wood, all of the same length.

The strips of cedar wood are then passed through a machine which cuts out a groove on the upper side. The grooved pieces of wood are laid on the bench of a man who has a number of pieces of plumbago, or "black-lead," ready. He fills each groove with a piece of this, having first put a little glue on the lead to make it stick in its place. The cradle, with the lead, is now ready to have the other wooden part of the pencil fastened over it.

# THE SQUARE PENCIL IS MADE ROUND

The wood of the pencil is not in two equal parts. That which is grooved to receive the lead is thicker than the other. The second piece is not grooved, but is flat. The part containing the plumbago goes to another man, and he lays on the flat portion of the wood, and neatly glues both together. The result is a square pencil. Another machine is now necessary to plane the pencils and make them round, or flat-sided, and even.



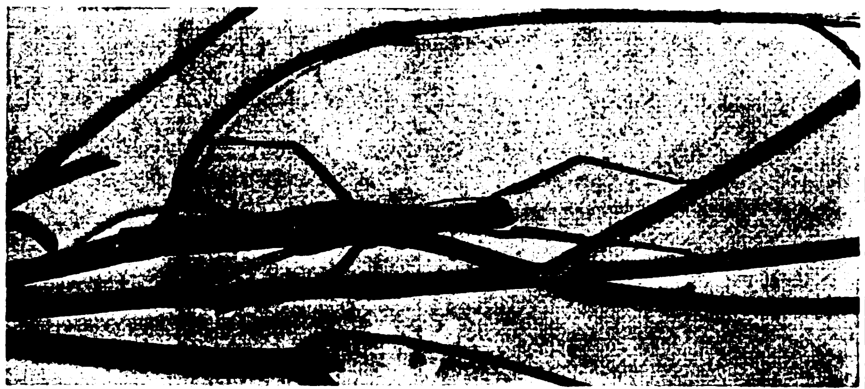
**Having been shaped and reduced to the proper thickness, the pencils come in long sticks to the workshop, where they are made nice to look at and to handle. They have to be stained and polished to make them pretty, as well as useful. Nobody would like to use a rough, ugly-looking pencil, and it is easy to make them neat and pleasant to hold. Some are coloured red, others yellow, brown, or black, and then they are stacked.**

# THE PENCILS ARE READY FOR SCHOOL

**All this time the pencils are very long, for it would be a waste of time to make them in short lengths. They are now placed in a little machine; and a man, by pulling a lever, causes a strong blade to come down and cut each long pencil into two, or three, or more, of the right size for using. The process is the same for all pencils.**

**The only manufacturing process remaining is to stamp upon the pencils the letters showing whether they are hard, hard and black, soft, or soft and black. Then the manufacturer's name is stamped on, and the pencils are made up into bundles of dozens, packed up in boxes, and are ready to go to the shops and the schools.**

THE NEXT PICTURES OF FAMILIAR THINGS ARE ON PAGE 3439



A stick insect that in colour and form looks almost exactly like the twigs on which it rests

# ANIMALS WITH WONDERFUL COATS

CONTINUED FROM 3304

ARCTIC FOX

THERE is an old joke known to nearly all of us who have been to a circus. Two clowns enter the ring, and one says to the other: "Do you know how to catch a rabbit?" "Why, how should I catch a rabbit?" asks the other. "The best way to catch a rabbit is to sit behind a hedge and make a noise like a turnip," says the first clown in reply.

Now, none of us would play such a trick upon our friends as to say that in Nature's family creatures sit behind hedges and pretend to be turnips. That would be rather silly. But the idea of the old circus joke comes back to mind when we remember that insects perch on leaves and twigs, and pretend to be leaves and twigs. Shall we say "pretend to be"? No, that carries us too far. The wonder of the structure of the insects is sufficient as it is without our letting fancy run us into the danger of overstepping the bounds of common-sense.

The leaf insect and the stick insect are among the most wonderful examples of what we call protective mimicry, but we must not say that the insect deliberately plans its own colour. It would be just as incorrect to say that the ptarmigan deliberately changes its feathers to white in winter, or that the mountain hare deliberately alters the colour of its winter coat to match the snows among which it lives. It is by one of the great mysterious processes of Nature that these humble insects are able to make themselves like their surroundings; and it is by the operation of the same law that the giraffe and the tiger are able to become invisible among *their* surroundings.

The great white bear of the Polar regions did not get his white fur by thinking that it would be better for him to have a coat matching the snow of his native land. Man is the only living creature that can deliberately do these things. Man has a mind; he remembers yesterday, and last year, and the years before that, and he plans for the years that are to come. None of the creatures of the wilds are wise enough to copy the arts of man. Man, however, copies the animals.

One of the things that the lower orders of creatures have taught us is protective mimicry. In the old days, when our soldiers went forth to war, they wore their glaring bright uniforms. These showed up distinctly against the grass and rocks among which they had to fight. Nowadays, when we send out our soldiers to war we dress them in an inconspicuous uniform called by the Indian name khaki—a material which looks like the colour of the earth and rocks. We even paint the bright parts of the guns with khaki, so that they shall not glisten and prove a mark for the sharpshooters of the enemy. This is a recent change in war, but in the lives of the lower creatures it has been practised for perhaps millions of years.

It has not come suddenly. It was not done in a day or a night, nor in a year. Take the case of the humming-bird moth. That is so marvellously like the humming-bird that men have shot it in mistake for the bird. That seems rather a queer sort of " protection " for the moth. But those moths were there long before men and guns appeared. In the old days they were persecuted by insect-eating birds and other creatures. Then it would happen that one or two moths were born different from the others. They would be larger, and look a little like a bird. Their likeness to the bird and their larger size would lead to their being spared by birds, which mistook them for something else. Naturally, then, the young ones of these would be like their parents, and would have a better chance of rearing young ones.

### MOTHS THAT LIVE SAFELY BY PRETENDING TO BE BIRDS

Gradually the moths that were like birds, always mating with other moths like themselves, would become a definite species. They would survive the perils which the others were unable to avoid. The old stock—the moths which looked simply like moths—would die out. They would find it impossible to live, because the more the other moths increased, the more would those of the original type be sought as food. So in course of time the first strain would become extinct, and those which had imitated the humming-birds would possess the whole part of the country where the others had been. They would survive, because they were the fittest to survive, because, by unconsciously imitating birds, they had deceived their enemies.

And what is true of the gradual formation of the species of humming-bird moths is true also of the other wonderful creatures which live by trickery. Their art is the outcome of ages and ages of development. The improvement has come little by little, and the change of form, very slowly effected, has become permanent, because it is necessary for the very life of the creature benefited by it. That is the thing we have all to remember — that these resemblances of forms of animal life to their surroundings, or to other and better-protected forms of life, are always brought about because they are necessary for the well-being of the creatures affected. There is a cause for everything that happens in Nature, of which all who will may discover at least something.

### WHY ONE BIRD BECOMES WHITE IN WINTER, AND ANOTHER REMAINS BLACK

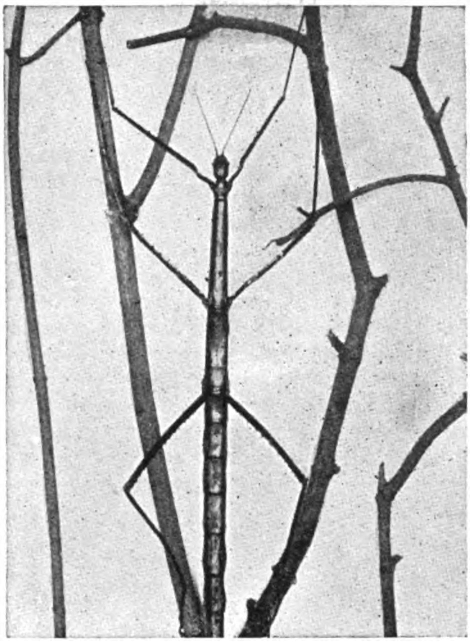
Those of us who have followed the CHILD'S BOOK OF NATURE from the beginning to the present point have noticed repeated instances of the manner in which animals, birds, fishes, reptiles, and insects are safeguarded in this way. On the other hand, careful observers will have noted that there are striking exceptions. It is only fair, when we are stating a general and important rule, that we should grapple, as far as we are able, with the difficulties which exceptions seem to present. Let us see if we can answer, in advance, some of the questions to which this story may give rise.

Why should a ptarmigan be able to change its plumage to pure white amid the snows of the Highland winter, when the relatives in the Arctic snow of our friends, the ravens, have to show themselves in glossy black, winter and summer ? That is a fair question. The answer seems to be this: that the ptarmigan has need of its white plumage in winter so that it may seek its food in safety upon the moors and hills, without being discovered by its enemies, as it quickly would be, were it to wear its summer garb of coloured feathers. The raven, on the other hand, does not seek its food from things growing upon the ground. It feeds on carrion, and is free to fly wheresoever it will. Therefore, it is not in need of protection such as is necessary for the very life of the ptarmigan. It need not fear death through being plainly visible on the snow.

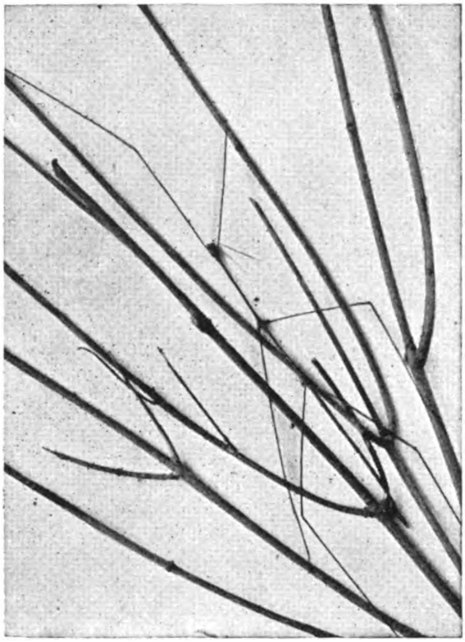
### WHY THE SABLE DOES NOT CHANGE HIS BROWN COAT IN THE SNOW

A stronger contrast, however, is presented by the Polar bear and the sable. The Polar bear lives in the Arctic regions, and the sable lives in bitterly cold Siberia. Siberia has a generous summer, but the cold there brings snow and ice in winter almost as bad as that of the Arctic regions. Why, then, cannot the sable change his coat to white in

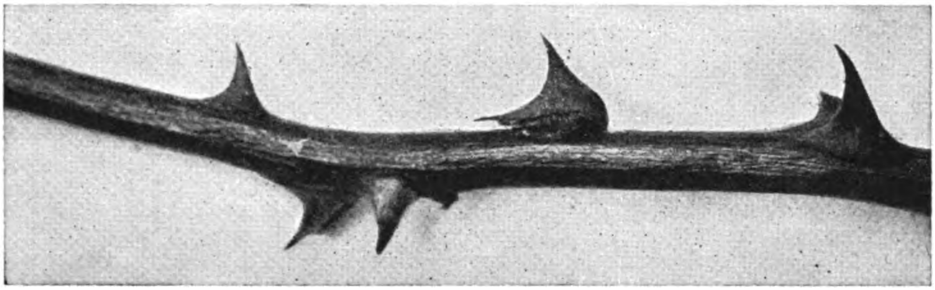
# INSECTS THAT PRETEND TO BE PLANTS



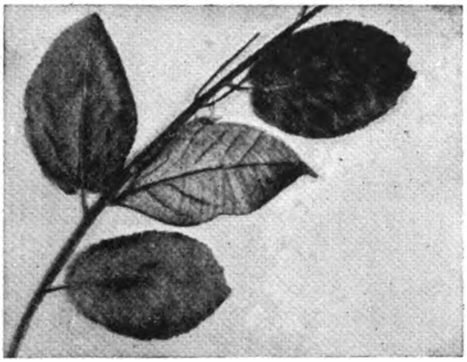
The stick insects are among the greatest marvels of Nature. As we may see from this one that is common in Ceylon, the creatures bear a remarkable resemblance to the twigs of the trees on which they rest.



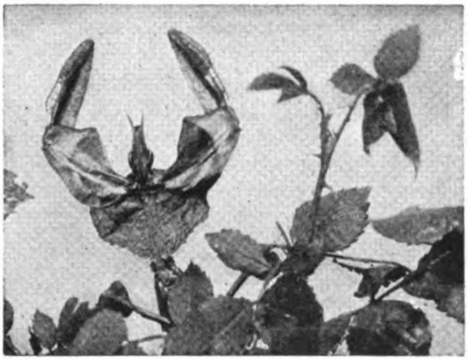
Some of the stick insects are thirteen inches long, and yet so closely do they resemble twigs that it is often impossible to discover them even when looking straight at them. This picture shows a stick insect from Brazil.



Some of the largest stick insects are found in Brazil, but quite as wonderful is another insect common in that country that exactly resembles the thorns of the plants on which it rests, as may be seen in this picture.



The Indian leaf butterfly, shown here, has the upper surface of its wings very gaudy and conspicuous, but when it rests it closes its wings, and is then, in shape and colour, almost an exact copy of a withered leaf.



There is an insect in Mozambique that closely resembles a flower, as may be seen here. It pretends to be an orchid, in order to obtain food, for when butterflies visit the supposed flower they are quickly seized.

winter, instead of living always in the rich brown fur which is so famous and so costly? The Arctic fox and the ermine, like the bear, change theirs. The Polar bear, indeed, is white all the year round, the only bear to enjoy this distinction. Snow and frozen waters are always to be found in the Arctic regions, winter and summer, hence it would be a disadvantage for the Polar bear, which seeks seals and fish, to change his coat in summer. The Arctic fox, on the other hand, strays farther from the sea with its ice, and from the fields which are always covered with snow; so that it *is* to his advantage to change his colour with the seasons.

How, then, about the sable? The reason that he does not alter his colour in winter or summer is this: when snow and ice abound in winter, the sable has to seek his living in the bushes and trees. He is very hungry, and eats a vegetable and meat diet. In the bushes and trees he finds berries which help to make up his meal. He is thankful for these; but still more welcome to him are the birds which he is able to catch.

### HOW THE CUNNING SABLE HIDES IN THE TREES AND CATCHES BIRDS

Now, if the coat of the sable were white, like the snow, he would be easily detected as he creeps along the branches. With his brown fur, however, he is not readily distinguished from the trees and bushes along which he makes his way. Therefore, being so protected from observation, he is able to pounce upon unwary birds that would otherwise be beyond his reach. His colour is the means of his being able to get the food necessary for his existence. If he were white, very likely he would starve, for the berries alone would not suffice to feed him.

Then there is the musk-ox, whose dingy, shaggy coat is always plainly seen against the snow—whence comes his protection from colour? The plainness with which he can be seen is not a source of danger to him, but of protection. Left alone, a musk-ox, gallantly as he might fight, would soon become the prey of savage, hungry animals. He may be brave, but he cannot alone resist the attacks of animals with powerful, tearing teeth. But a herd of musk-ox together might defy quite powerful enemies. Therefore, in case of danger, it is necessary that the musk-ox should be able readily to see his comrades, so that he may rush to them. He can easily see them in their dark coats, but he could not if their coats were white like the snow.

### A WONDERFUL INSECT THAT CAN MAKE ITSELF LOOK LIKE A LEAF

Having answered these questions, let us return to our insects, and see if the marvels of the leaf insects and stick insects stand alone in the story of Nature's miracles. We shall soon find that they do not. The leaf insects and stick insects seem to have reached the highest stage of perfection in protective mimicry, but the defences of other weak little creatures are found equally wonderful in their way. But let us first discuss these wonderful stick and leaf insects.

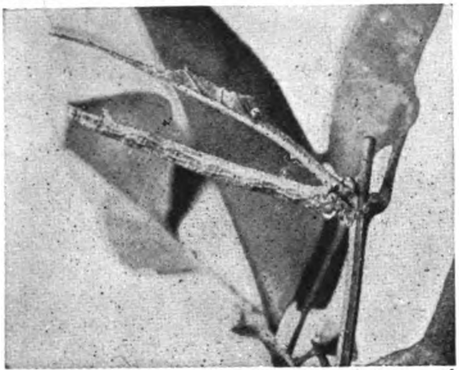
A curious thing is the way in which the natives are deceived by the leaf insect. Its home is in the hot countries; it is found, for example, in perfection in Ceylon. Now, the eyesight of natives is generally sharper than that of Europeans. Living a savage or partly savage life, they become very keen-sighted, for their success in gaining food depends very largely upon the keenness of their vision. If, then, the leaf insect manages to deceive the native hunters, we may rest assured that it is indeed a wonderful creature.

And it does deceive them completely. They believe that the leaf insect is really part of the plant on which they discover it. It grows like a leaf, they say, and is really part of the leaf for the early stages of its life, and then, when it reaches maturity, it loosens itself from the plant and flies away. Of course, that is a mistake. A tree or plant may feed an insect, but life comes from the Power which created the tree. We might just as well say that the caterpillar of the clothes-moth is created by the cloth or fur in which it is born. But we can forgive the natives for their error.

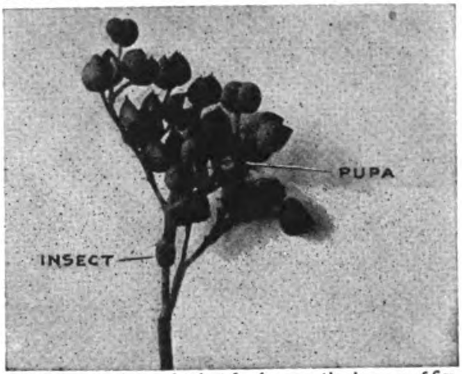
### HOW THE LEAF INSECT DECEIVES THE CLEVEREST OF MEN

When English naturalists first studied the leaf insects, they said: "To such perfection has Nature carried her arts in these insects, that you would declare, upon seeing some of the insects, that they had robbed the trees of their leaves to form for themselves artificial wings,

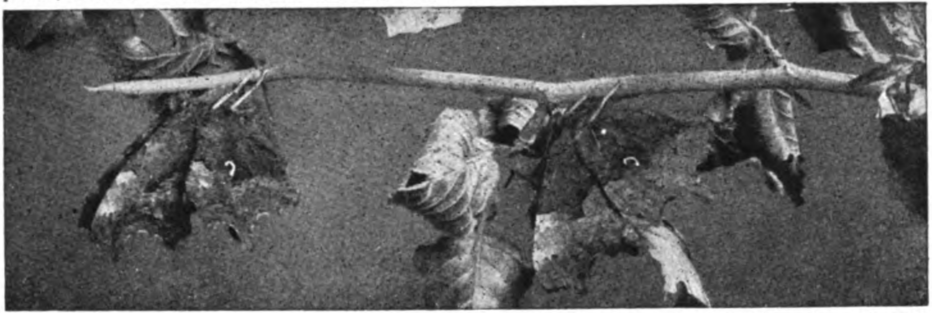
# HOW INSECTS DECEIVE THEIR ENEMIES



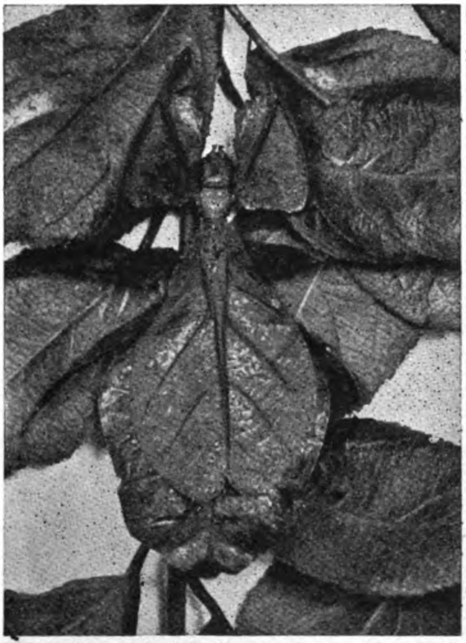
Some geometrid caterpillars, like that of the waved umber moth shown here, are known as stick caterpillars, because of their habit of imitating twigs.



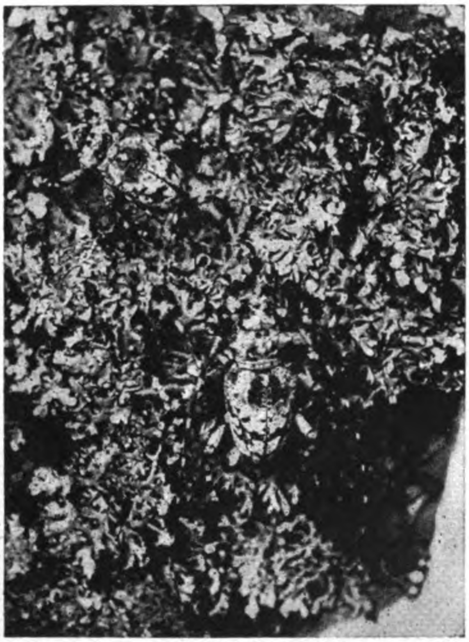
A little English beetle that feeds upon the leaves of figwort, spins a cocoon for its pupa stage that resembles a seed capsule of the plant, and so escapes notice.



The comma butterfly, which gets its name from a white mark like a comma on its wings, is one known to almost every lad. The underside of the wings varies through all the browns and dull greens of **faded leaves, and when the butterfly is at rest, as shown here, it is difficult to distinguish from a dead leaf.**



This leaf insect from Ceylon exactly resembles a leaf, **not only in its shape and green colour, but in its markings, which are just like the veins of a leaf.**



Some beetles resemble the bark and lichen on which **they rest. Here are two such beetles from the East Indies which are difficult to distinguish from the lichen.**

so exactly do they resemble them in their substance and internal structure." Stick insects and leaf insects belong to the same family, but there is the same sort of difference between the two species that there is between the centipedes and the millipedes. The body of the stick insect is narrow, and shaped like a cylinder; the body of the leaf insect is broad and flat. The leaf insect is coloured exactly like the leaves among which it rests. The abdomen is broad and flat, and green or dark yellow. If it lives among green leaves, the body will be found to be green; if the leaves be withering, the leaf insect will look just the same colour as the foliage, dried up and withered, as it seems. The legs are broad and leaf-like, so that they pass for parts of the leaves. But perhaps the wings are the most wonderful. In every respect they resemble the leaf of a tree or shrub.

Let us study the picture of the green insect from Ceylon on page 3411. We can hardly tell where the real leaf ends and the insect begins. Down the centre there appears to be the main nervure of the leaf, and branching off to right and left there seem to be lesser nervures. The shading of the wing-sheaths is exactly like that of the leaf.

### THE LEAF INSECT'S WINGS THAT CHANGE COLOUR LIKE A DYING LEAF

How does the insect get this extraordinary resemblance to the leaf? The trick is effected by Nature, by means which might seem almost to justify the mistake of the natives. The colouring is the result of what is known as chlorophyll, which is the green colouring matter of plants. The formation of the elytra, or wing-sheaths, is similar to the construction of the leaf of the plant. The resemblance is not only on the surface, but, more wonderful, in the internal structure of the insect. Even when the life of the insect ends, the resemblance does not depart. One such insect which has passed its life among green leaves would always remain, when alive, green like the plants; but when it dies, the body of the insect changes colour exactly like a dead leaf.

The food of the leaf insect which we have been considering is the leaf which it resembles. But there is another species of leaf insect which does not rely upon this sort of diet. This one, which flourishes in Mozambique, is a flesh-eater. Its food consists of butterflies and other insects. So the insect has to practise to deceive its victims into the belief that it is something else than a hungry, carnivorous animal. This it manages to do by imitating the orchid.

### AN INSECT THAT PRETENDS TO BE A FLOWER AND FEEDS ON BUTTERFLIES

Its colour and form resemble the flower of a beautiful orchid. It settles upon an orchid and rests quite still. Butterflies approach in the belief that the insect forms part of the orchid from which they desire to extract nectar. In an instant the insect starts up, catches the butterfly, and eats it.

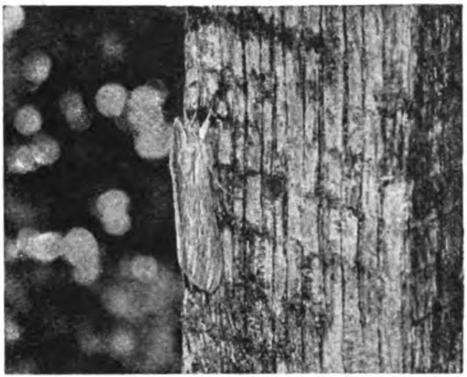
These two species of insects give us the story in a nutshell of the whole scheme of mimicry. One is coloured to resemble plants, so that it may escape the attacks of stronger creatures which would destroy it. The other is coloured to resemble a flower, so that it may be mistaken for something quite harmless by creatures upon which it depends for food. And throughout wild Nature this plan works in these two directions. The lion and tiger are coloured to resemble their surroundings so that their intended victims may not see them; the humming-bird moth and the leaf insects, and all the lesser creatures that need protection, are coloured and shaped so that they may go their way through life always being mistaken for something else by the things that would eat them.

After having admired the wonders of the leaf insect we cannot be more astonished by other creatures, but we have to admit that the claims upon our admiration of the stick insects are just as strong. They are as marvellously protected in their way as leaf insects are.

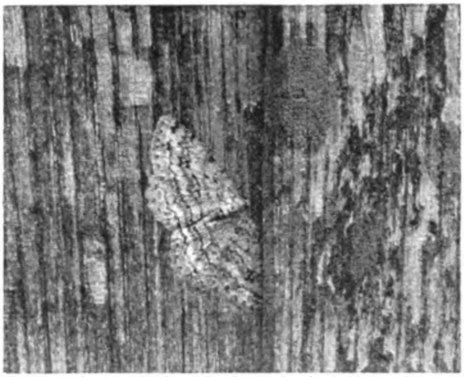
### A WONDERFUL INSECT THAT RESTS IN A TREE AND DISAPPEARS BEFORE OUR EYES

In fact, some of them might fairly challenge the leaf insects for the right to be considered the best actors in Nature. Think of a great insect thirteen inches long—three inches longer than this page—resting on a shrub within a few inches of our eyes and being invisible, though fully exposed to view. There is the insect, right before us, but we peer and turn about

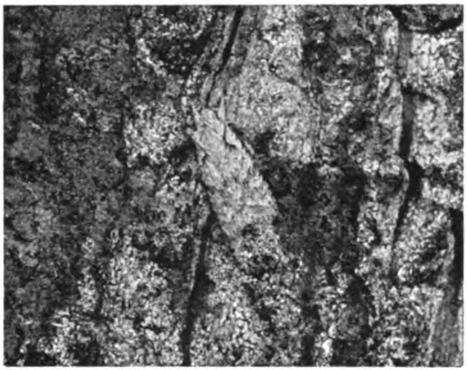
# MOTHS HIDING FROM THEIR FOES



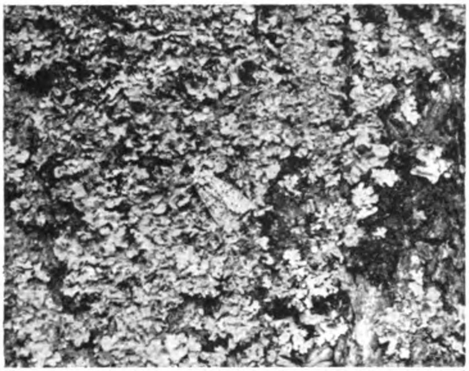
Moths are mostly creatures of the night, but when they appear in daylight they escape from enemies by their resemblance to their surroundings. This shark moth is remarkably like the wooden paling on which it rests.



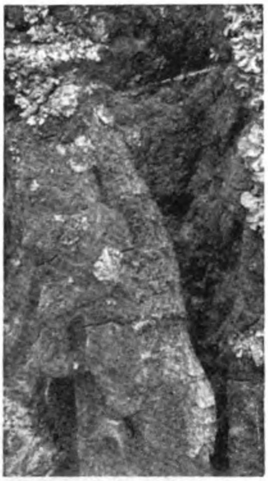
The small engrailed moth, shown in this picture, is grey and brown in colour, mottled with darker shades, and as it rests on an oak paling it looks exactly like a patch of lichen, or other natural discoloration of the wood.



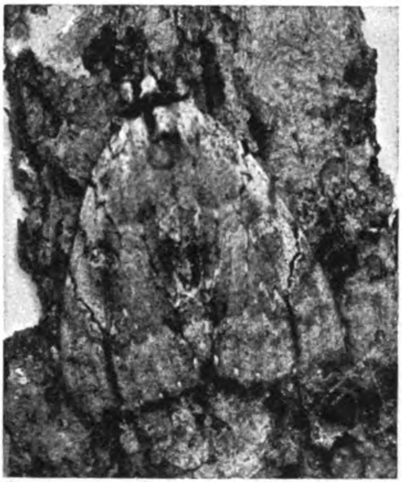
The grey shoulder-knot moth, shown here, first appears **in autumn. It is pale grey with black markings, and its colours so harmonise with the trunk of the oak on which it rests that it is seen only by close scrutiny.**



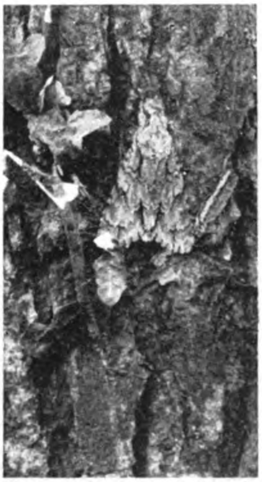
The marvel du jour moth is, in colour, bright green and **white, with black markings; but it passes unnoticed by its enemies, because it rests upon the bright green lichen on tree-trunks, with which its gay colours harmonise.**



The caterpillar of the red underwing moth is so like the **trunk of the poplar on which it lives that it is discovered by touch more often than by sight.**



The red underwing moth itself is also splendidly protected, for though large and handsome **when the wings are expanded in flight, its upper wings, that show when at rest, exactly resemble a tree-trunk or discoloured masonry.**



The dark dagger moth, that is very like the commoner grey **dagger, is hard to discover, because of its resemblance to its surroundings when at rest.**

The photographs on these pages are by H. Irving, A. E. Tonge, and Percy Collins.

to discover it, and peer in vain. A gentleman who had a couple of these insects alive took some friends to see them. He took them close to a tree. "There they are," he said, "they are both there," and he nodded his head in the direction of the tree. The friends stared until their eyes ached, then turned to him with a smile, thinking that he was playing a trick on them. "I assure you that they are there, right before your eyes," he said.

### THE WONDER OF THE STICK INSECTS THAT ARE SEEN AND YET UNSEEN

They gave it up, and though they were close up to the tree, he had to point with his finger to the insects before the untrained eyes of his friends could discover them. Once he had touched them the stick insects were plainly visible. But how wonderful that people who had gone out solely to see them, and had stood close to them, should be unable to tell them from the twigs of the tree! So it was, and so Nature intended that it should be.

Of course, if the insects were flying, they would be readily seen. Not all of the species have wings, but some have two pairs of wings, a small pair in front and a larger pair at the rear. But here we have cause for more wonder. When the wings are open, it is found that the hinder pair have half their surface brightly coloured, while the other half is quite plain. The extended wings, so gay and handsome, are easily to be seen. But the insect comes to rest as we watch, and, lo! there is nothing to be seen. We see twigs and stems, but no insect. Where is the brightly coloured insect which we saw flying a moment ago? The explanation is that the smaller pair of wings is folded down over the front part of the hinder wings, and looks just like the rest of the body. The second pair of wings, however, shows no colour; they cannot be distinguished from the rest of the body.

### A MARVELLOUS TRANSFORMATION SCENE IN AN INSECT'S LIFE

Now we understand why half the lower wings are coloured and half plain. The coloured part is folded up and covered by the half which is plain, and now not the sharpest eye could detect the presence of wings at all. Instead of a gorgeous, winged insect which we saw a moment ago, we see what looks like a little branch of the shrub or tree. The whole body is long, slender, and round, and coloured like the wood of the tree. But the insect has long legs; how is it to dispose of these? The legs help to deceive, instead of betraying their owner. They are themselves shaped like twigs, and as we look at the insect we fancy that the body is a stoutish stem and the legs are merely thinner twigs branching out in different directions from an older stem.

So long as it remains still, the insect is not to be seen. When it moves, it is so remarkable in appearance that it well deserves its title of the "walking stick." Its home is on shrubs, or among undergrowth, or on the stems of tall grass. It rests by day and seeks its food by night, hence its life is probably as safe as that of anything in the insect world.

These two insects, being naturally sluggish in character, may be said to be specially favoured in their struggle for existence. The less they wander about, the less they are likely to be seen and caught. But there are other insects whose lives depend upon their getting about the world. They must find food for themselves, and they must find a suitable place in which to lay their eggs, or their race would perish.

### HOW NATURE PROTECTS THE LIVES OF BUTTERFLIES AND MOTHS

The means of protection in their case is just as effective. We find this specially so in the case of moths and butterflies. We have studied this subject already, but as we have a picture of the famous leaf butterfly, we may refer to the matter again. Here is a beautiful butterfly which, when it is flying, is handsome as can be. But when it settles to rest on a tree, not the keenest human eye would readily find it. It raises its wings and brings them together, and there we have what appears one of the ordinary leaves of the tree. Its relative, the dead-leaf butterfly, chooses resting-places where its appearance suggests that it is a leaf which has died.

Luckily, we have not to go to India, or even to a zoo, for these remarkable sights; we may find a splendid example in the common lappet moth. The moths fold their wings differently from the butterflies, not up, but flat down on the back.

Now, this means a serious difference in the scheme of protection for the two. The butterfly, as he shows the underside of his wings when at rest, must have that side soberly coloured, and the gaudy hues all on top. The moth, on the other hand, showing the upper side of the wings when at rest, must be coloured underneath, not on the upper surface, or, when he settled down to rest, his life would not be worth ten minutes' purchase, as we say.

The lappet moth is not content to be merely soberly coloured on top of his wings; he is so formed that when he rests he looks exactly like a little cluster of dead leaves. Then we must not forget that there are moths and butterflies that resemble wasps and bees, so that, avoided by insect-eating creatures which fear the sting of the wasp and the bee, they escape destruction by their deceit.

### INSECTS THAT LOOK LIKE THORNS AND BEETLES THAT LOOK LIKE MOSS

On page 3409 is a picture of a Brazilian insect, which, living among trees bearing thorns, looks so marvellously like a thorn itself that, though our photograph is taken at short range, we should hardly be able to tell the insect from the true thorn unless it were marked for us on the picture. Mosses and lichens serve as homes for many insects, as well as for coverings for the homes of clever birds which use moss and lichen to adorn and hide their nests. In the East Indies they have beetles which are coloured exactly like moss; and there is another creature, like a stick insect, called the moss insect, which looks exactly like a branching twig of some plant over which moss has grown.

We have been studying how insects are protected by natural colouring and disguise. Somewhere in their family history there must have been definite acts of selection—deliberate choice by females of mates whose shape and colouring made them most like their surroundings. The result has been that their successors have become more and more like the leaves, and twigs, and moss, among which they make their dwellings, or more and more like the other insects, and other articles, whose appearance they have insensibly copied. The same sort of thing is constantly going on to-day. The insects that are best protected in this way are the insects that have the best chance of escaping hungry enemies, and so of rearing families of their own. The creatures that imitate other creatures have just the same sense of security from their disguise.

### LIVING THINGS THAT ARE NOT WHAT THEY SEEM

The moths and butterflies that most nearly imitate things having an unpleasant taste, and therefore not likely to be eaten, are the most daring of their family. They fly, without haste and without care, in the sunlight, or in the light of evening, where insect-eating birds abound. They know that they need not fear, because by their appearance they are deceiving their enemies into believing that they are not good for food. The butterflies and moths are not the only forms of animal life to do this, of course. There is a winged bug which goes about disguised as a hornet; there is a caterpillar which pretends to be a stick; there is a timid little oriole which has managed to make itself like the powerful friar-bird, and so escapes. The cuckoo wears something the look of the fierce sparrow-hawk, and by its formidable appearance is able to frighten from their nests the little birds among whose eggs the cuckoo determines to place her own.

Few of us would, at first thought, suspect the frog of protection of this sort. We know that our toads and frogs in this country, if they rest still in their abiding place, are very hard to distinguish from their surroundings; but we know also that they are bound to hide and to mask themselves in this manner lest they should be gobbled up by ducks, or other birds, that like frogs and toads. But there is one bold little frog in San Domingo that does not hide.

### A LITTLE FROG WITH A RED COAT THAT IS AFRAID OF NOTHING

Among frogs coloured like dead leaves and green leaves, or resembling clods of earth, this daring little frog hops about among the enemies of frogs, as comfortably as if he were lord of the whole scene. The others dare not move by daylight, but this one, coloured as gaily as vivid red and blue can make him, hops about in the broad daylight. A naturalist, who was puzzled by this, caught some and took them home, and gave them to his poultry. The birds, though they liked ordinary frogs, would not touch these scarlet-coated creature. At last, however, by throwing down meat, for which the birds eagerly scrambled, the gentleman managed to get a duck to snatch up one of the frogs. But in an instant the duck dropped it, and ran about shaking its head as if something horrible had entered its mouth. That is why that bold little frog goes out by daylight, fearless of birds and snakes and all the other enemies of frogs—it tastes too bad to be eaten, and it is therefore afraid of nothing.

This case, like the others, is one in which the protection is afforded by Nature. There are cases, however, where the insect has to take means of protection just as the caddis worm, the crab, and the hermit crab have to. There is a little insect that lives on the fig-wort which, when it spins its cocoon and enters the pupa stage, becomes, of course, entirely defenceless, and unable to run away from any enemy which may threaten it. But the wise little creature makes its cocoon so much like the seed of the fig-wort that it escapes detection.

### AN INSECT THAT DRESSES IN A DIRTY COAT AND PLAYS THE BOGEY MAN

Even that is not so strange as the tricks of an insect called the *reduvius personatus*. This insect, in its perfect state, has wings; but in its early life it has not. In these early days, then, it is exposed to many perils. What is it to do to escape ? It does the strangest thing. It drags itself through the old webs of spiders, covers itself with web and dust, and makes itself a monstrous size and most unpleasant in appearance. It is really the bogey man of insects. In this disguise it is quite secure. When the time comes for it to have wings, and so be safe, it brushes off the covering of dirt and web, and comes forth quite a neat and handsome insect.

But it is not by mimicry alone that insects are protected. Some of them are worse than our spitting friend, the llama—they shoot out acid. The most famous of these marksmen is the bombardier beetle, which, when threatened, squirts from its body a liquid which resembles nitric acid. Not only can it shoot strongly; it can make a report with its shooting like the tiniest of tiny guns. This report, which must sound quite loud to the senses of an attacking insect, is at once taken up by the whole family of bombardiers who may happen to be on the spot at the time, and away they fire, bang! bang! bang! as if the intruder had stumbled upon a whole battery of insect cannons. The bombardier can fire from twelve to twenty shots in succession, and after a rest is ready for another cannonade.

### SPIDERS THAT PRETEND TO BE DEAD AND CATERPILLARS THAT THROW OUT POISON

This is a very effective weapon, and it serves the bombardier and other creatures that practise it in the place of the power to feign death. Perhaps the spiders are the finest masters and mistresses of the latter art. They curl up in an instant if threatened, and will rest under the closest examination, looking as dead as a door-nail.

The caterpillar of the puss moth should be handled with extreme care, for it possesses in exceptional degree the power to squirt forth its hateful poison. One day a gentleman who did not heed this fact went to look at some puss moth caterpillars which he had put away in a box with some leaves of the sort that they like. The moment he raised the lid, one of the caterpillars squirted forth a jet of acid which entered the right eye of the gentleman. He felt the most dreadful pain, and had to rush away for a doctor, who told him that the poison was very powerful indeed, and such as seriously to injure the eyeball. The pain lasted for several hours, and not for days after was he able to see properly.

Some caterpillars that cannot squirt acid are armed with hairs that produce an irritating rash upon us if we get them on the face or body. The hairs are the armour of those caterpillars, and serve so well for defence that the cuckoo is practically the only bird in England which will eat them.

### THE PROTECTING CARE OF NATURE OVER ALL HER CHILDREN

Such, then, are some of the ways in which Nature protects the humblest of her children. The same thing happens in the desert as in the tropical forest, in the snows of the Arctic regions, and in the warm seas of the tropics. Everywhere we find the same rule in force for the benefit of wild animal life.

The next stories of Nature are on 3675.

## A POEM ABOUT THE VIKINGS

**THIS fine poem suggests something of the fierce spirit of the Vikings, those warriors of the sea whose home was in that part of Europe we call Scandinavia. When a Viking chief died, his body was placed in a boat, which, with full sail set and a fire lighted, was sent drifting out to sea. As the fire consumed the vessel and the body of the dead, it was supposed that the chief thus made his last journey, entering into Valhalla, the land of the gods. In this stirring poem of King Balder's funeral voyage, the tragic interest is the greater from the fact that the king is not dead when he sets sail for Valhalla, but is voluntarily going forth to his fate. The king is named after one of the gods in the Norse mythology, and we must admire the indomitable spirit of these old pagans, whose stories of their imaginary gods are full of a beautiful bravery. This poem was written by Charles Mackay, a well-known poet and journalist, who was born in 1814 and died in 1889.**

# THE SEA-KING'S BURIAL

CONTINUED FROM 3350

"My strength is failing fast,"
Said the sea-king to his men,
"I shall never sail the seas
Like a conqueror again,
But while yet a drop remains
Of the life-blood in my veins,
Raise, oh, raise me from my bed;
Put the crown upon my head;
Put my good sword in my hand,
And so lead me to the strand,
Where my ship at anchor rides
Steadily;
If I cannot end my life
In the crimsoned battle-strife,
Let me die as I have lived,
On the sea."

They have raised King Balder up,
Put his crown upon his head;
They have sheathed his limbs in mail,
And the purple o'er him spread;
And amid the greeting rude
Of a gathering multitude,
Borne him slowly to the shore—
All the energy of yore
From his dim eyes flashing forth—
Old sea-lion of the North—
As he looked upon his ship
Riding free,
And on his forehead pale
Felt the cold, refreshing gale,
And heard the welcome sound
Of the sea.

They have borne him to the ship
With a slow and solemn tread;
They have placed him on the deck
With his crown upon his head,
Where he sat as on a throne;
And have left him there alone,
With his anchor ready weighed,
And his snowy sails displayed
To the favouring wind, once more
Blowing freshly from the shore,
And have bidden him farewell
Tenderly,
Saying: "King of mighty men,
We shall meet thee yet again,
In Valhalla, with the monarchs
Of the sea."

Underneath him in the hold
They had placed the lighted brand;
And the fire was burning slow
As the vessel from the land,
Like a stag-hound from the slips,
Darted forth from out the ships.
There was music in her sail
As it swelled before the gale,
And a dashing at her prow
As it cleft the waves below,
And the good ship sped along,
Scudding free;
As on many a battle morn
In her time she had been borne,
To struggle, and to conquer
On the sea.

And the king with sudden strength
Started up, and paced the deck,
With his good sword for his staff,
And his robe around his neck.
Once alone, he raised his hand
To the people on the land;
And with shout and joyous cry
Once again they made reply,
Till the loud, exulting cheer
Sounded faintly on his ear;
For the gale was over him blowing
Fresh and free;
And ere yet an hour had passed,
He was driven before the blast,
And a storm was on his path,
On the sea.

"So blow, ye tempests, blow,
And my spirit shall not quail;
I have fought with many a foe,
I have weathered many a gale;
And in this hour of death,
Ere I yield my fleeting breath—
Ere the fire now burning slow
Shall come rushing from below,
And this worn and wasted frame
Be devoted to the flame—
I will raise my voice in triumph,
Singing free;
To the great All-Father's home
I am driving through the foam,
I am sailing to Valhalla,
O'er the sea.

" So blow, ye stormy winds—
And, ye flames, ascend on high;
In easy, idle bed
Let the slave and coward die!
But give me the driving keel,
Clang of shields and flashing steel;
Or my foot on foreign ground,
With my enemies around!
Happy, happy, thus I'd yield,
On the deck or in the field,
My last breath, shouting 'On
To victory.'
But since this has been denied,
They shall say that I have died
Without flinching, like a monarch
Of the sea."

And Balder spoke no more,
And no sound escaped his lip;
And he looked, yet scarcely saw
The destruction of his ship,
Nor the fleet sparks mounting high,
Nor the glare upon the sky;
Scarcely heard the billows dash,
Nor the burning timber crash;
Scarcely felt the scorching heat
That was gathering at his feet,
Nor the fierce flames mounting o'er him
Greedily,
But the life was in him yet,
And the courage to forget
All his pain, in his triumph
On the sea.

Once alone, a cry arose,
Half of anguish, half of pride,
As he sprang upon his feet,
With the flames on every side.
" I am coming!" said the king,
" Where the swords and bucklers ring—
Where the warrior lives again,
Where the souls of mighty men—
Where the weary find repose,
And the red wine ever flows.
I am coming, great All-Father,
Unto Thee!
Unto Odin, unto Thor,
And the strong, true hearts of yore—
I am coming to Valhalla,
O'er the sea."

## *UNCLE SAM'S YOUNG ARMY

This stirring little piece comes from the pen of Mrs. Lilla T. Elder, and has a wonderful swing of enthusiasm in its lines.

We are Uncle Sam's young army,
And we're twenty million strong—
All together we are marching,
Marching, marching right along.
Not one coward is among us,
Every heart is staunch and true;
And although we are but children,
Yet there's something we can do:
We can guard our country's colours,
Raise them high with cheer and song.
For we're Uncle Sam's young army,
And we're twenty million strong.

Well we know the splendid stories
Of the brave deeds of the past,
And our country we have promised
That such bravery shall last.
Loyal we will be and love her,
True in every word and deed,
That we may be worthy of her
When it comes our turn to lead.
Now we can but guard her colours,
Proud that to us they belong:
For we're Uncle Sam's young army,
And we're twenty million strong.

And although the smoke of battle
Shadows our dear land to-day,
Still we little colour-bearers
With the flag can light the way.
See, how glad are all to cheer it.
Praises come from every mouth.
One great nation kneels to bless it,
East and West and North and South.
All together we are marching,
Marching, marching right along—
For we're Uncle Sam's young army,
And we're twenty million strong.

## THE LAME BROTHER

Mary Lamb, the sister of Charles Lamb, had a very sad life, and was subject to fits of mania. Her brother Charles devoted himself to watching over her and protecting her. Their literary labours together did much to brighten and make useful the life of the sister, who, though greatly inferior to her brother in literary gifts, had still a talent for pleasant and simple verse. Their elder brother, John, had been lamed in his youth, and these verses by Mary Lamb were, no doubt, suggested by the infirmity of her brother.

My parents sleep both in one grave;
My only friend's a brother.
The dearest things upon the earth
We are to one another.

A fine stout boy I knew him once,
With active form and limb;
Whene'er he leaped, or jumped, or ran,
Oh, I was proud of him!

He leaped too far, he got a hurt,
He now does limping go—
When I think on his active days,
My heart is full of woe.

He leans on me, when we to school
Do every morning walk;
I cheer him on his weary way,
He loves to hear my talk:

The theme of which is mostly this,
What things he once could do.
He listens pleased—then sadly says,
" Sister, I lean on you."

Then I reply, " Indeed you're not
Scarce any weight at all—
And let us now still younger years
To memory recall.

" Led by your little elder hand,
I learned to walk alone;
Careful you used to be of me,
My little brother John.

" How often, when my young feet tired,
You've carried me a mile!
And still together we can sit,
And rest a little while.

" For our kind Master never minds,
If we're the very last;
He bids us never tire ourselves
With walking on too fast."

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## A CHRISTMAS CAROL

There's a song in the air!
There's a star in the sky!
There's a mother's deep prayer
And a baby's low cry!
And the star rains its fire while the Beautiful sing,
For the manger of Bethlehem cradles a king.

There's a tumult of joy
O'er the wonderful birth,
For the virgin's sweet boy
Is the Lord of the earth.
Ay! the star rains its fire and the Beautiful sing,
For the manger of Bethlehem cradles a king.

In the light of that star
Lie the ages impearled;
And that song from afar
Has swept over the world.
Every hearth is aflame, and the Beautiful sing
In the homes of the nations that Jesus is King.

We rejoice in the light,
And we echo the song
That comes down through the night
From the heavenly throng.
Ay! we shout to the lovely evangel they bring,
And we greet in his cradle our Saviour and King.

—Josiah Gilbert Holland.

## THE CHILDREN'S HOUR

**This is one of the most charming of the minor poems by H. W. Longfellow, and it pictures for us with real feeling one of the greatest joys of life: the story-telling hour with the little ones. The story of the Bishop of Bingen, mentioned in the fourth verse, is told at length in Southey's poem of "Bishop Hatto."**

Between the dark and the daylight, when the night is beginning to lower,
Comes a pause in the day's occupations, that is known as the Children's Hour.
I hear in the chamber above me the patter of little feet,
The sound of a door that is opened, and voices soft and sweet.

From my study I see in the lamplight, descending the broad hall stair,
Grave Alice, and laughing Allegra, and Edith with golden hair.
A whisper and then a silence; yet I know by their merry eyes
They are plotting and planning together to take me by surprise.

A sudden rush from the stairway, a sudden raid from the hall!
By three doors left unguarded they enter my castle wall!
They climb up into my turret o'er the arms and back of my chair;
If I try to escape they surround me; they seem to be everywhere.
They almost devour me with kisses, their arms about me entwine,
Till I think of the Bishop of Bingen, in his Mouse-tower on the Rhine!
Do you think, oh, blue-eyed banditti, because you have scaled the wall,
Such an old moustache as I am is not a match for you all?

I have you fast in my fortress, and will not let you depart,
But put you down into the dungeon in the round-tower of my heart.
And there will I keep you for ever, yes, for ever and a day,
Till the walls shall crumble to ruin, and moulder in dust away.

## HOW TO WRITE A LETTER

In the early years of last century, when children's books were very quaint productions, chiefly concerned with illustrating the awful results of naughty conduct, a Mrs. Elizabeth Turner wrote many of these little works, such as "The Cowslip" and "The Daisy," which were meant to be "cautionary" stories for children, but to-day would be more likely to amuse young readers than to caution them. The following verses by Mrs. Turner, however, are quite happy, and may be commended as the best possible advice to those who find it difficult to write a letter—young and old alike. Mrs. Turner died in 1846 at the age of seventy-two.

Maria intended a letter to write,
But could not begin (as she thought) to indite;
So went to her mother with pencil and slate,
Containing "Dear Sister," and also a date.

"With nothing to say, my dear girl, do not think
Of wasting your time over paper and ink;
But certainly this is an excellent way,
To try with your slate to find something to say.

"I will give you a rule," said her mother, "my dear,
Just think for a moment your sister is here,
And what would you tell her? consider, and then,
Though silent your tongue, you can speak with your pen."

## * GOD SENDS LOVE TO YOU

There are few stories in the Old Testament more beautiful than that of Naaman and the little Jewish maid Ruahmah, which tells us of how that young captive contrived to teach her master about the love of God. Dr. Van Dyck, an American poet of to-day, has written a beautiful play, entitled "The House of Rimmon," which deals with this subject, and Ruahmah is therein made to sing the following beautiful song.

Above the edge of dark appear the lances of the sun;
Along the mountain ridges clear his rosy heralds run;
The vapours down the valley go,
Like broken armies, dark and low.
Look up, my heart, from every hill
In folds of rose and daffodil
The sunrise banners flow.

Oh, fly away on silent wing, ye boding owls of night!
Oh, welcome, little birds that sing the coming-in of light!
For new, and new, and ever new,
The golden bud within the blue;
And every morning seems to say:
"There's something happy on the way,
And God sends love to you!"

---

* From "The House of Rimmon," copyright, 1908, by Charles Scribner's Sons.

## SEVEN TIMES ONE

"Seven Times One" was written by Jean Ingelow, and is the first in a series of poems called the "Songs of the Seven." It tells the thoughts of a little girl upon her seventh birthday.

There's no dew left on the daisies and clover,
There's no rain left in heaven.
I've said my "seven times" over and over—
Seven times one are seven.

I am old—so old I can write a letter;
My birthday lessons are done.
The lambs play always—they know no better;
They are only one times one.

O Moon, in the night I have seen you sailing
And shining so round and low.
You were bright—ah, bright!—but your light is failing;
You are nothing now but a bow.

You Moon, have you done something wrong in heaven,
That God has hidden your face?
I hope, if you have, you will soon be forgiven,
And shine again in your place.

O Columbine, open your folded wrapper,
Where two twin turtle-doves dwell.
O Cuckoo-pint, toll me the purple clapper
That hangs in your clear green bell.

And show me your nest, with the young ones in it,
I will not steal them away.
I am old, you may trust me, linnet, linnet,
I am seven times one to-day.

## THE KITTEN AND THE FALLING LEAVES

Although the subject of this poem by William Wordsworth is rather commonplace, the poet has treated it with a delicacy that makes it very interesting.

See the kitten on the wall,
Sporting with the leaves that fall,
Withered leaves—one—two—and three—
From the lofty elder-tree!
Through the calm and frosty air
Of this morning bright and fair,
Eddying round and round they sink
Softly, slowly: one might think,
From the motions that are made,
Every little leaf conveyed
Sylph or fairy hither tending,
To this lower world descending,
Each invisible and mute,
In his wavering parachute.
—But the kitten, how she starts,
Crouches, stretches, paws, and darts!
First at one, and then its fellow,
Just as light and just as yellow;
There are many now—now one—
Now they stop and there are none:
What intenseness of desire
In her upward eye of fire!
With a tiger-leap half-way
Now she meets the coming prey,
Lets it go as fast, and then
Has it in her power again:
How she works with three or four,
Like an Indian conjuror;
Quick as he in feats of art,
Far beyond in joy of heart.
Were her antics played in the eye
Of a thousand standers-by,
Clapping hands with shouts and stare,
What would little Tabby care
For the plaudits of the crowd?
Over happy to be proud,
Over wealthy in the treasure
Of her own exceeding pleasure!

## THE BURIAL OF THE LINNET

Mrs. Ewing, who lived from 1842 to 1885, was in her day an extremely popular writer for the young, and many of her stories are still in circulation. She also wrote poetry, of which the following is an example, but she is better remembered for her charming stories of quiet everyday life.

Found in the garden dead in his beauty—
Oh that a linnet should die in the spring!
Bury him, comrades, in pitiful duty,
Muffle the dinner-bell, solemnly ring.

Bury him kindly, up in the corner;
Bird, beast, and goldfish are sepulchred there.
Bid the black kitten march as chief mourner,
Waving her tail like a plume in the air.

Bury him nobly—next to the donkey;
Fetch the old banner, and wave it about;
Bury him deeply—think of the monkey,
Shallow his grave, and the dogs get him out.

Bury him softly—white wool around him,
Kiss his poor feathers—the first kiss and last;
Tell his poor widow kind friends have found him:
Plant his poor grave with whatever grows fast.

Farewell, sweet singer! dead in thy beauty,
Silent through summer, though other birds sing.
Bury him, comrades, in pitiful duty,
Muffle the dinner-bell, mournfully ring.

## TRY AGAIN

These familiar lines by William Edward Hickson have been as often quoted as some of the finest poetry in our language, although, of course, they are only rhymes for children. It is the idea here, rather than the form in which it is expressed, that makes the words worthy of quotation. Hickson wrote on educational matters, and lived from 1803 to 1870.

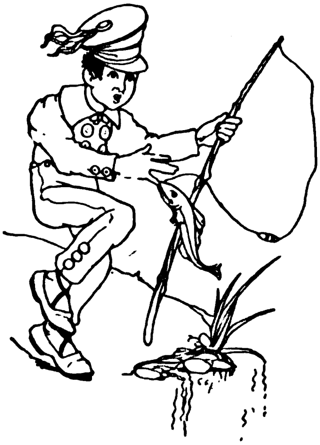
'Tis a lesson you should heed,
Try again;
If at first you don't succeed,
Try again;
Then your courage should appear,
For if you will *persevere*,
You will conquer, never fear,
Try again.

Once or twice, though you should fail,
Try again;
If you would at last prevail,
Try again;
If we strive, 'tis no disgrace
Though we do not win the race;
What should we do in that case?
Try again.

If you find your task is hard,
Try again;
Time will bring you your reward,
Try again;
All that other folk can do,
Why, with patience, may not you?
Only keep this rule in view,
Try again.

# LITTLE VERSES FOR VERY LITTLE PEOPLE

One, two, three, four, five,
Once I caught a fish alive,
Six, seven, eight, nine, ten,
But I let him go again.



Why did you let him go ?
Because he bit my finger so.
Which finger did he bite ?
The little one upon the right.

Poor Dicky's dead ! The bell we toll,
And lay him in the deep, dark hole.
The sun may shine, the clouds may rain,
But Dick will never pipe again !
His quilt will be as sweet as ours :
Bright buttercups and cuckoo flowers.

"Little maid, pretty maid, whither goest thou ?"
"Down in the forest to milk my cow."
"Shall I go with thee ?" "No, not now ;
When I send for thee, then come thou."

Oh, my pretty cock ! Oh, my handsome cock !
I pray you, do not crow before day,
And your comb shall be made of the very beaten gold,
And your wings of the silver so gray.

Dance, little baby, dance up high,
Never mind, baby, mother is by ;
Crow and caper, caper and crow,
There, little baby, there you go ;
Up to the ceiling, down to the ground,
Backwards and forwards, round and round ;
Dance, little baby, and mother will sing,
With the merry coral, ding, ding, ding !

Under the window is my garden,
Where sweet, sweet flowers grow ;
And in the pear-tree dwells a robin,
The nearest bird I know.

Tho' I peep out betimes in the morning,
Still the flowers are up the first ;
Then I try and talk to the robin,
And perhaps he'd chat—if he durst.

You see, merry Phillis, that dear little maid,
Has invited Belinda to tea.
Her nice little garden is shaded by trees,
What pleasanter place could there be ?

There's a cake full of plums, there are strawberries too,
And the table is set on the green ;
I'm fond of a carpet all daisies and grass,
Could a prettier picture be seen ?

A blackbird (yes, blackbirds delight in warm weather),
Is flitting from yonder high spray.
He sees the two little ones talking together,
No wonder the blackbird is gay.

Rub-a-dub-dub,
Three men in a tub ;
The butcher, the baker,
The candlestick-maker ;
And they all jumped out of a rotten potato.

Diddley-Diddley-Dumpty,
The cat ran up the plum-tree,
Half-a-crown
To fetch her down,
Diddley-diddley-dumpty.

My house is red—a little house,
  A happy child am I:
I laugh and play the livelong day,
  I hardly ever cry.

I have a tree, a green, green tree,
  To shade me from the sun;
And under it I often sit,
  When all my work is done.

My little basket I will take,
  And trip into the town.
When next I'm there I'll buy some cake,
  And spend my bright half-crown.

I love little pussy.
  Her coat is so warm,
And if I don't hurt her,
  She'll do me no harm.

So I'll not pull her tail,
  Or drive her away,
But pussy and I
  Very gently will play.

She will sit by my side,
  And I'll give her her food,
And she'll like me because
  I am gentle and good.

# A CHILD'S EVENING PRAYER

Words by ALFRED P. GRAVES.

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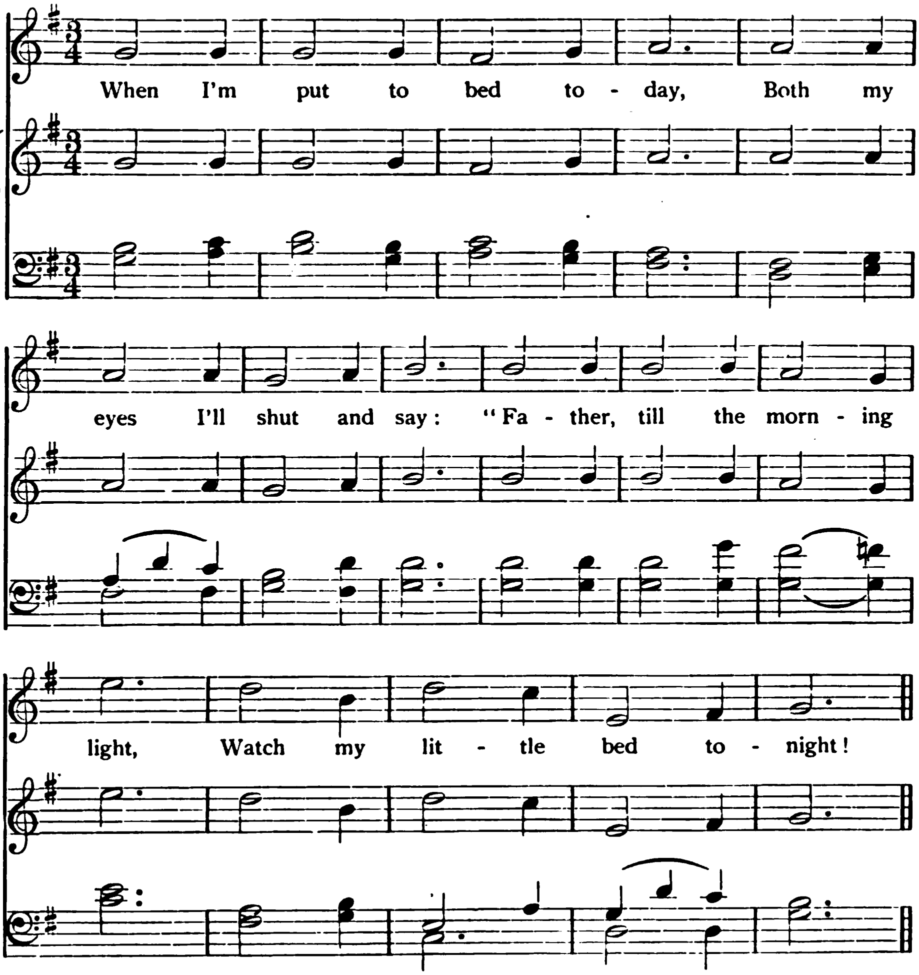

When I'm put to bed to - day, Both my
eyes I'll shut and say: "Fa - ther, till the morn - ing
light, Watch my lit - tle bed to - night!

"All the people in all lands
Take unto Your loving hands;
Old and young and great and small,
From all danger guard them all!

"Give the sick ones gentle sleep,
Dry the eyes of those that weep,
And, please, leave the moon to light
All poor travellers through the night!"

# The Child's Book of SCHOOL LESSONS

## READING

# THE VERB AND ITS MOODS

CONTINUED FROM 3376

As I write this lesson, I am sitting by the sea, watching many boys and girls digging on the sands and paddling in the water. If I were to say to you, " I have just had a bath," I should be making a statement about something that I have just done. And if I were to ask you, " Have you had a bath ? " I should be asking you a simple or direct question. But supposing I gave you an order, and said, " Go and have a bath," I should be no longer merely stating something, but I should be commanding you to go and do something. So, you see, there are at least two different *manners* or *ways* of talking about actions : (1) We can either make simple statements, or ask simple questions about them, as "The cow JUMPED over the moon," " The boy STOOD on the burning deck," " Who KILLED Cock Robin ? " (2) We can tell people to go and do them, as " Polly, PUT the kettle on," " Zachariah, BLOW the fire."

Now, another word for *manners* or *ways* is MOODS, and so we call these two different MOODS of the verb. The first is called the IN-DI-CA-TIVE MOOD, because it indicates or points out ; and the second is called the IMPERA-TIVE MOOD, because it is imperial (like an emperor) and gives orders. Here are some more examples of the Imperative Mood :

" Little Boy Blue, COME, BLOW, on your horn."

" If at first you don't succeed, TRY, TRY again."

" TELL me the old, old story, (imperative)
For I FORGET so soon." (indicative)

" CHARGE, Chester, CHARGE ! On Stanley, on," (imperative)
WERE the last words of Marmion. (indicative)

" Pat-a-cake, Pat-a-cake, Baker's man :
BAKE me a cake as fast as you can ; (imperative)
STICK it, and PRICK it, and MARK it with B (imperative)
And SEND it home for Baby and me." (imperative)

" BE thou faithful unto death (imperative,
And I WILL GIVE thee a crown of life." (indicative)

Now, do you think you can pick out for yourselves the examples of these two MOODS in the following sentences ? Try.

" Suffer little children to come unto Me, and forbid them not, for of such is the Kingdom of Heaven."

" Heap on more wood, the wind is chill."

" Snail, snail, put out your horns,
I'll give you bread and barleycorns."

" Hold the fort, for I am coming."

" Try not the pass, the old man said :
Dark lowers the tempest overhead."

There are 6 imperatives and 6 indicatives in those sentences. Have you found them all ?

Here are some lines that may help you to remember these two moods :

If you order a person to bring you some chalk,
Or tell him to eat up his food ;
Or bid him be seated or go for a walk,
You use the Imperative mood.
But when you are telling him what you have done,
Or asking him what are his views,
Or stating the fact that twice two are not one,
The Indicative mood you will use.

If you learn these little verses you will find that you will have no difficulty in discovering the moods of any verbs you come across from time to time.

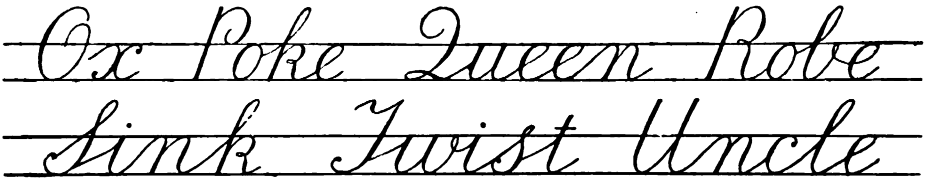
WRITING

# A NEW WAY OF WRITING FIGURES

"MOTHER, we wrote words with fourteen capital letters last time," said Nora, when she and Tom next came to their mother for a writing lesson.

"Then there are twelve more," observed Tom. "And we stopped at N, so we begin with O."

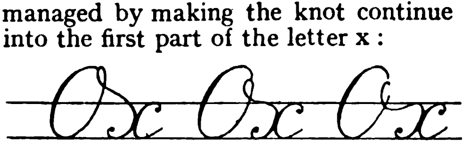
"That's right, Tom," said his mother. "Here are the words to be written now:"



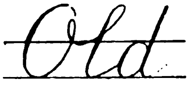
"Q, R, and U join on nicely," said Nora, as she looked at these words. "T can't manage to join any better than the first G, and, mother, don't you think something might be done to help O ? The other letters were so kind to it before."

"Suppose we try, Nora," was the reply. "But mind that pen. If you knock it about so, the ink will drop on the tablecloth. It is safer to lay pens down when they are not being used."

Tom wanted to see what he could do for O, and this is what Nora and he managed by making the knot continue into the first part of the letter x :

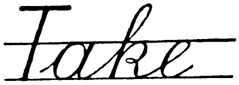


Their mother pointed out that O joins more easily on to a looped letter like l, in this word "old" :



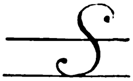
Tom liked what he called T-square T, and asked to have a word beginning with that letter.

"It doesn't join on, Tom. See !" said his mother, as she wrote "Take."



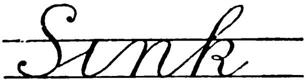
Meanwhile Nora had been thinking about capital S, and noticing how the pen ran round the lower part of it after making the loop on the up-stroke of the letter.

"There is another way of making capital S," said her mother. "It is very like printed S, and begins and ends with a dot. Tom will fetch a newspaper from the bookshelf, and we shall be able to see how curly both are."



"What a pretty letter !" exclaimed Nora, who liked the curves and the way the upper and lower parts were balanced. Tom hunted among the printed S's in the newspaper, and showed Nora how much they were like the printed S they were writing.

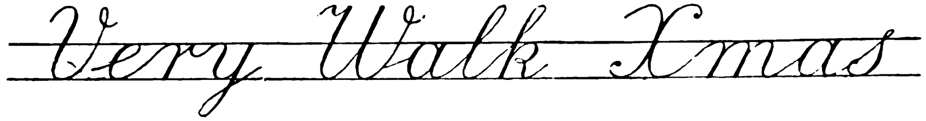
"It joins on badly, like the other one," said Nora.

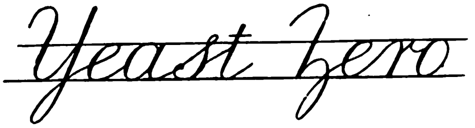


"Now there are V, W, X, Y, and Z to write as capital letters," the children's mother said, as she gave them the words to copy which we shall find on the top of the next page.

"V and W are the only capital letters there that do not join," Nora remarked.

"It is possible to join them, but awkward," said her mother. "There are some words, like 'What,' in which





h joins fairly well, but when a vowel follows it, it is clearer to leave the letters unjoined. We must always remember, that directly letters are at all difficult to recognise, the writing is bad. So it is far better not to try to join on certain capital letters until you have thoroughly mastered the use of your pens. X, Y, and *Z* join on to any letter with ease.

"You have not yet learned to write the Roman numerals, so we will write them now. They are easy because they seem to be formed from capital letters.

"Some of these are the same as letters, though it is unlikely they really come to us from letters. V, for instance, is probably X halved. But it is easy to think of the Roman numerals as letters—one or I, two ones or two I's, three ones or three I's, one before five, five or V, one after five, two after five, three after five, one before ten, ten or X, one after ten, two after ten, and so on till twenty or two X's.

"The numbers between twenty and thirty, or XX and XXX (two tens and three tens), are made by adding the numerals from I to IX. Forty is XL, or ten before fifty, as L stands for fifty. Sixty is ten after fifty, or LX. Seventy is twenty after fifty, or LXX. Eighty is thirty after fifty, or LXXX. Ninety is ten before a hundred, or XC, for one hundred is C (short for Latin *centum*, meaning a hundred). So, you see, I or X before another number means take one or ten from it; after it, add one or ten to it. The Roman numerals take it for granted, that every girl and boy can do subtraction and addition."

I II III IV V VI VII VIII IX X
XI XII XIII XIV XV XVI XVII
XVIII XIX XX XXX XL L LX
LXX LXXX XC C

ARITHMETIC

# HOW TO DIVIDE BIG NUMBERS

In our last lesson we learned how to divide the number 596 by 4. It is quite as simple to divide any other number, even though it be a large number, containing millions or hundreds of millions, by any number from 2 to 12. The multiplication table is all that is required, we shall find.

Divide 5279517 by 9.

9 ) 5279517
586613

Here there are 5 millions, but since that is less than the divisor, 9, it is clear, of course, that we shall not have millions in our answer. But we "carry" the 5, and placing it before the 2, we get 52 (hundred-thousands). Then say:

9 into 52, 5 and 7 over.
9 into 77, 8 and 5 over.
9 into 59, 6 and 5 over.
9 into 55, 6 and 1 over.
9 into 11, 1 and 2 over.
9 into 27, 3.

Divide 43848 by 12.

12 ) 43848
3654

Here, again, there are not enough ten-thousands to give any ten-thousands in the answer, so we have to carry the 4, and get 43 (thousands) before we can begin the division.

Say, 12 into 43, 3 and 7 over.
12 into 78, 6 and 6 over.
12 into 64, 5 and 4 over.
12 into 48, 4.

We have, of course, noticed by this time that the figure which we carry, the figure which is "over," can never be as big as our divisor. For, in learning what division was, we counted, let us suppose, the tens into each group until there were not enough tens left to make another for each group. That is, the number "over" was always less than the divisor.

When our divisor is greater than 12, the idea used in the division is the same as before, though the process is longer. For this reason, the method we have been learning is called *short* division; while the method for numbers greater than 12 is called *long* division.

Still, there are many numbers greater than 12 for which we can use short division. Suppose, for example, we have a number of things which we wish to arrange in groups which each contain 15 things. We know that there are 5 *threes* in 15. So, if we first arrange the things in groups of *three*, and then form larger groups by taking *five* of the groups of three, it is clear that each of the larger groups will contain five threes—that is, 15.

Divide 229695 by 15.

3 ) 229695
5 ) 76565
15313

As explained above, we first divide 229695 by 3. This shows us that 229695 things can be arranged in 76565 groups of three. We next divide 76565 by 5—that is, we form groups which each contain 5 of the groups of three, or 15 of the given things. The division gives us 15313 of these large groups, so that 229695 divided by 15 gives 15313.

In this way we are able to divide by any number which comes in our multiplication table. Thus, to divide by 108, we divide by 9, and then divide the result by 12; because 9 times 12 make 108, so that the first division forms groups of 9, and the second division forms groups which each contain 12 groups of 9, or 108.

In the above example, the two numbers 3 and 5, which when multiplied together make 15, are called *factors* of 15. Similarly 12 and 9 are factors of 108. The process just explained is, therefore, called *division by factors*.

It should be noticed that many numbers have more than one set of factors. Thus, 4 times 9 make 36, and 6 times 6 also make 36. To divide a number by 36 we may use whichever set of factors we like.

In our next lesson we shall learn long division, which has to be used in all cases where the divisor cannot be separated into factors.

EXAMPLES:

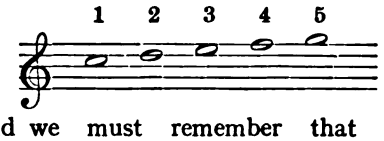
1. Divide 184429 by 7.
2. Divide 2043646 by 11.
3. Divide 816408 by 8.
4. Fifty-nine thousand and forty apples are to be packed in baskets. If each basket holds 72 apples, how many will be required?
5. How many times can 132 be taken away from 2997324?
6. A piece of ground contains 12096 strawberry-plants, in 96 rows. How many plants are there in each row?

MUSIC

# THE RESTING GAME OF THE FAIRIES

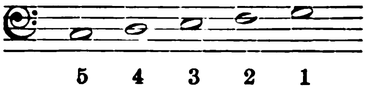
THE fairies have something new to tell us; they say the white notes and the black notes may also be called *keys;* and when we talk of the entire number of black and white keys together, we are to call them the *keyboard.*

To-day we are to put our right hand on the keys. The fingers are just to rest on the key surface, but *we are not to press the notes down.* Our fingers must be curved, and just separated, so that each one may have a key to itself. We shall have five keys following one another in order, like this:

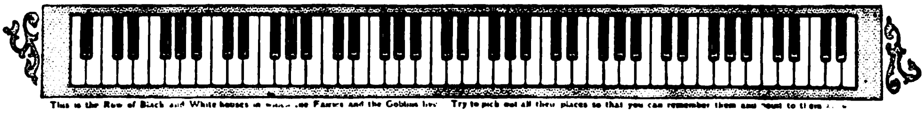


and we must remember that the fairies want the back of our hand to be quite level.

It is very easy to let the little-finger side of our hand slope downwards; but our fairy friends do not like this at all; so we must watch very carefully. The first finger (we very often call it the thumb) must be quite free; we must not squeeze it against the hand, and the fingers 2—3—4—5 must rest in the middle of their notes. When we are quite sure that the right hand is properly placed, we must let the left hand take its turn, and play exactly the same game. The fingers must rest on the surface of five white keys:



but, just as before, *they are not to press the notes down.* Each finger must be separated from the other, so that each one may have a key to itself; the back of the hand must be quite level, the first finger quite free, while fingers 2—3—4—5 must occupy the middle of their notes.



This is the Row of Black and White houses in which the Fairies and the Goblins live Try to pick out all their places so that you can remember them and [illegible] to them [illegible]

**The keyboard of the piano**

The fairies call this "the resting game," and they like each hand to play it in turn. Of course, while we are only thus resting on the surface of the keyboard, we cannot make the fairies sing; but it means that we are getting ready to make the lovely tone we so want to hear.

You and I want to make the piano sing, and that is why we are taking such trouble with our arms, our hands, and our fingers. We must think of our fingers, our hand, our forearm (that is the part of our arm near the hand), and our upper arm as four tools ready to do the different kinds of work we shall find necessary to make the fairies tell all their secrets. To-day we are learning how to rest, so that fingers and hands may be quite in their proper position, and quite loose—that is, free from any stiffness. The fairies give us one very safe, sure rule: *Whenever we feel stiff, we are wrong,* and it is a rule which we must always remember.

When we are quite sure our hands are resting in their proper position on the keys, we will again play the "fairies' see-saw game." We must keep our fingers just touching their notes, the hand being quite loose, and then, without depressing the key, balance the arm at the wrist, up and down, about an inch each way. This will show us if we are resting properly now our fingers are on the keys. You see, we have four games to play every day, and we must never forget one of them.

1. The sleepy arm.
2. Bending our fingers towards the palm of our hand, and then letting them spring back.
3. The fairies' see-saw.
4. The resting game and the see-saw together.

A man came into the world to show us how beautifully the piano fairies could sing. His name was Chopin. He played the piano exquisitely, and he tried to teach other people to do so, too.

Nothing made him more unhappy than to hear anyone *hit* the piano, or play at all roughly. He would say, "Is that a dog barking?" He was quite sure that the piano fairies could not make an unmusical sound unless they were approached wrongly, and treated badly. A pupil once told him that she had learned more from listening to singing than anything else. What do you think was his reply?

"That is right, all music ought to be song."

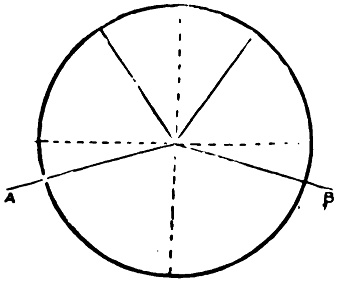
Frederick William Faber, who wrote some of our finest hymns, left us a beautiful idea when he sang about music:

There are sounds like flakes of snow falling,
  In their silent and eddying rings;
We tremble, they touch so lightly,
  Like feathers from angels' wings.

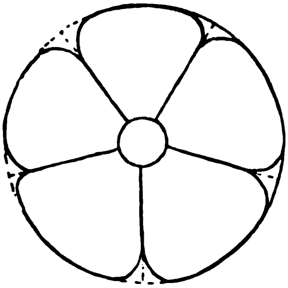
We must always remember that we move the notes or keys for one purpose only—*to obtain music.* If we want the fairy songs in all their beauty, we must call forth the lovely tone-pictures they paint for us, by *thinking, listening, and feeling.* We must think what the fairies want us to hear. We must listen for the *beginning* of every sound, to know we have found the right one. We must feel how much we have to do to set the keys moving.

# MAKING CIRCLES AND FILLING THEM IN

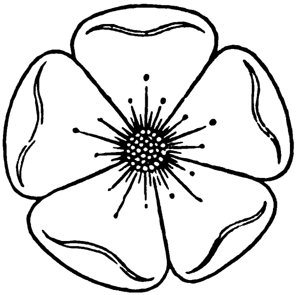
EVERY boy and girl who learns drawing hears sooner or later the story of Giotto's famous O. In Italy the saying " Round as Giotto's O " has become a proverb. Giotto was a famous Italian artist, and when the Pope wanted a certain piece of work done, and sent a message to ask Giotto for some of his work that he might judge if he were clever enough to do it for him, Giotto took a piece of white paper, and with some red paint drew a circle so perfect that everyone marvelled, and the Pope needed no further proof of his skill.



1. How to divide a circle for five-petalled flower

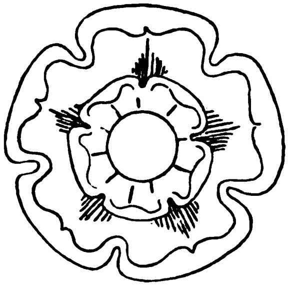


2. Outline of five-petalled flower in a circle



3. The finished five-petalled flower

Circles are very, very difficult to draw, worse than straight lines, yet it is more natural for us to draw a curve than a straight line.



4. Heraldic, or Tudor rose

Our baby brothers and sisters always make scribbles in the shape of circles if we give them paper and pencil, and if we stand at the blackboard we shall find it easier to draw big sweeping curves than to draw lines.

To-day we will practise circles with white chalk on the blackboard or on sheets of brown paper pinned on the wall.

The first curve is the biggest one, drawn from the shoulder, standing at arm's length away from the board. The first half or two-thirds is easy; we draw outwards, not towards the chest at first; then we reverse and come back over the old line till the two ends join. The next curve is drawn from the elbow in the same way, but the circle is smaller, of course; and after practising these till we are satisfied, we will go to the drawing-board again and try these curves with charcoal on white paper, drawing from the elbow—that is, resting the elbow on the table and keeping it there while we draw—and then from the wrist, resting the arm on the table just between the wrist and elbow. The smallest circle is made by resting the hand firmly on the table, drawing from the wrist, and making the curves just as large as the fingers will let us.

When we have made good circles, which we can only do with plenty of practice, we will put in one of them the heraldic rose which came in our last lesson. It is difficult to put a five-petalled flower into a circle with freehand drawing, as all the petals must be the same size. The best way is shown in picture 1 on this page.

The two diameters—that is, the lines dividing the circles into quarters—are drawn as guides very faintly first; then the lines A and B just below the horizontal diameter. Now it is easy to draw in the petals as we see them in picture 2. The division between two petals always comes under the centre of one of the other petals, either the top or the bottom one.

There is a way by which we can divide circles exactly into parts, but this is done with compasses and to know how to do it we must learn geometrical drawing.

THE NEXT SCHOOL LESSONS ARE ON PAGE 3491.

# WHERE DOES THE RAIN GO?

CONTINUED FROM 3385

MANY things happen to the rain that sinks in the earth, and exactly what happens depends largely on what the surface of the earth is like at that particular place. A great deal of the rain remains in the soil to the depth of some feet, as soil water or ground water. If there is no such water there can be no vegetable life. But in places where rain falls, and the ground holds some of it, there we are sure to find plants of various kinds, that suck up a good deal of this water into themselves by their roots, and then give it back to the air. The soil also contains all sorts of life of other kinds besides green plants, such as various kinds of animals, like worms and insects, and also countless numbers of microbes. All these take up and use for their lives some of the water that the rain gives to the soil.

But still a great deal of the rain is not used up in any of these ways. Much of it is sucked up again into the air by the sun's heat, when the rain stops falling. Much of it also goes on sinking slowly through the earth until it reaches a layer of something that it cannot sink through. It may be carried on this layer to some lower level, where it may bubble up out of the ground as what we call a spring. In the long run almost all the rain that is not kept by living things, or given back to the air at once, gets into streams and rivers, and into the sea, where the sun sucks it up to go on its round again.

### WHERE DID ALL THE WATER IN THE OCEANS COME FROM?

We might at first think, if we remember how all the rivers run into the oceans, that rivers bring the water. But, after all, just as much water as the rivers bring is caught up by the sun into the air; and the amount of water in the sea is, in any case, too great for the rivers to account for. By far the greater part of the water in the oceans is what we may call the original water of the world, which has gathered in the ocean-beds because they are the most convenient places for it to be in, under the influence of the earth's gravitation. The water, as we know, was long ago held in the air when the air was much hotter than it is now. But, of course, it is right for us to ask where it came from even before it fell upon the earth and helped to form the oceans. The answer is that it was made ages ago by the burning of hydrogen with oxygen. Elements cannot combine with each other in intense heat, and so before the water of the world was formed it was very hot, and hydrogen existed separately, though there was plenty of oxygen near it. As the earth cooled a little, however, it became possible for hydrogen and oxygen to combine, which they did, forming water. There is vastly more oxygen than hydrogen in the world, as we know, and most of the oxygen which was left over when the hydrogen was burnt up to form water is to be found in the atmosphere still.

### HOW IS IT THAT THE WATER OF THE SEA DOES NOT SINK INTO THE GROUND?

Wherever it can, water does sink into the ground ; and where the sea is deep, the pressure of all the water above will force the water at the bottom into the ground if it can possibly go there. It is probable that in most places the ground of the sea is of a very dense kind which water cannot penetrate as a rule ; but often things may happen to it that will allow some water to pass through, and then, when that water reaches the hot levels of the earth's crust, it is turned into steam, and may make a great disturbance. We always think of earthquakes as things that happen on the dry land, but we know that earthquakes also occur in the bed of the sea. When a very powerful earthquake occurs in the bed of the sea, and a great deal of water sinks in and is turned into steam, we get what may be called a seaquake, and there is little doubt that some of the strange and terrible things which the sea does are caused in this way.

But we must suppose that, on the whole, the bed of the sea is not so easily penetrated by water as many parts of the dry land are, and that is perhaps one reason why it has become the bed of the sea. Instead of letting the water run through it, it holds the water upon the top of it, as the bottom of a basin does, and then the weight of the water gradually helps to force it down and make it cup-shaped, so that it will hold still more water. But we cannot be at all sure about this, for it is a very difficult thing indeed to find out.

### WHAT IS IT LIKE AT THE BOTTOM OF THE SEA?

No man has ever been to the greatest depths of the sea, for even if it were possible to send air down to him, the pressure of water above his head would be far too great for him to stand. But we can get some idea of what it must be at the bottom of the deepest parts of the sea, for we know the kind of things that live there, and we know something of the conditions of their lives. Three, five, or eight miles below the level of the sea there cannot be very much light, and though it cannot be perfectly dark, yet it is what any of us would call quite dark. Here there lives a strange medley of creatures—strange fishes and sea-weeds. Down to them, from above, there descend the remains of all sorts of other sea creatures that live in the heights of water above them.

If we remember that the sea covers something like five-sevenths of the whole earth, we shall see that, of the total amount of life upon the earth, a very large proportion is to be found at the bottom of the sea. It is life of a very humble kind for at least two reasons. One is the immense pressure of the water above it, which prevents the development of more noble forms of life ; the other reason, that has the same result, is the very small quantity of oxygen that is available for the purpose of life at the bottom of the sea. This means, of course, that the life of these creatures must be lived very slowly, and is indeed very different from the life of creatures that have air to breathe, or even a fish that lives in a stream which has plenty of oxygen dissolved in the water all around it.

### WHY DOES A BOTTLE FULL OF HOT WATER KEEP HOT LONGER THAN ONE HALF FULL?

The answer to this is that the bottle full of hot water contains more heat than the bottle which is only half full. Water is a wonderful storehouse of heat. Different things require different amounts of heat to be put in them in order to be raised to the same temperature or hotness. We might think this should not be so, but it is. If you take a certain quantity of water at any fixed temperature you please, and then the same quantity of anything else in the world, and then make them both, say, five degrees hotter than they were before, you will find that you have to put more heat into the water than into the other thing ; and just as it takes longer to heat water than to heat anything else, because you have to put more heat into it, so water takes longer to cool than anything else, because it has more heat in it to lose; and, of course, the greater the quantity of water, the more heat it has within it.

But there is another point to remember; the bigger the mass of anything is, the longer it takes to cool. A thing cools from its surface inwards; the parts inside it keep each other warm. The smaller the mass of a thing, the bigger is the proportion of its surface to the amount of stuff in it, and so the quicker it cools. So that the case of the hot-water bottles, the different rates at which the sun, the earth, and the moon get cool, and the fact that a baby requires to be more warmly clothed than a man, are all explained by the same law.

### WHERE DOES THE OXYGEN IN THE SUN COME FROM IF THERE ARE NO PLANTS?

It is rather difficult for us to understand, but we must remember that a thing may be intensely hot and glowing and flaming without any burning, combustion, or combining with oxygen going on. The thread inside an ordinary electric lamp is an instance of this. Now, long ago, astronomers thought that the sun's heat and flames were due to burning going on in the sun, just as it goes on in a fire on the earth; but then they came to ask themselves practically just the question we are asking: " If the sun's heat and light are due to combustion, where does all the oxygen come from, and where does all the fuel come from ? " If the sun were burning as a fire is burning, it would have burnt itself out millions of years ago. There is nothing like enough material in the sun to account for all the light and heat it produces. Therefore, burning, combustion, or combining with oxygen has nothing to do at all with producing the sun's heat and light, any more than with producing the heat and light of an electric lamp. The sun's supply of heat is kept up in other ways, partly by his ceaseless shrinking, and partly, we suppose, by the breaking up of the atoms of elements, such as radium, in the sun.

### IF THE EARTH'S CENTRE IS A BALL OF FIRE, WHY DOES IT NOT BURN UP EVERYTHING?

When we say burn or consume, we mean combine with oxygen. So, if there is no oxygen in a place, burning cannot go on. The things there may glow, and be intensely hot, but they cannot burn—which is to combine with oxygen—for there is no oxygen at all for the things to combine with. That is one answer to our question, but here is another. Very nearly the whole of the outside of the solid earth is already as burnt as it can be, and so is all the water of the oceans. However hot we make them, and however much oxygen we have, we cannot burn water or sand or flint or clay or gravel, for these things are already burnt. When the elements of which they are made have combined with all the oxygen that they are capable of combining with, then they are as burnt as they possibly can be. Thus, the whole exterior of the earth, with only very scattered and slight exceptions, has already been burnt up, and what we call the earth and the sea are the results of that burning. This burnt crust now encloses the fire in the centre of the earth, and keeps out the oxygen of the air—the oxygen which has been left over, so to speak, from what has been used up in burning the crust of the earth.

### WHY COULD NOT THE EARTH'S SHAPE BE ALWAYS UNDERSTOOD FROM AN ECLIPSE?

Of course, an eclipse of the sun by the moon would tell us nothing about the shape of the earth. So, to make our question quite correct, we should say not " an eclipse," but " an eclipse of the moon." Since this, as we know, is due to the earth's shadow creeping across the face of the moon because the earth is cutting off the sunlight by which the moon is lit, we are right and very thoughtful in supposing that the shape of the shadow ought to tell us the shape of the earth, just as our shadow tells our shape. And we find that the shadow is a convex one—that is to say, one curved outwards like the edge of a ball; in other words, it is a shadow of a globe or sphere, and since we know that the earth throws the shadow, that tells us the shape of the earth.

But this most important argument, though it is interesting now, could not be used in the days when men were disputing about the shape of the earth. It can only be used when we know what an eclipse of the moon really is; and we can only know what an eclipse of the moon really is when we have in our minds a picture of the solar system as it really is with the earth moving round the sun, and having the moon moving round it as it goes. Though this all seems so plain and simple to us now, we must remember that we did not find it out, and that it took great labour and a very long time to find out. That is why those who argued long ago that the earth is round could not point to the shape of the shadow in an eclipse of the moon, and say that that proved their case. No one knew that that had anything at all to do with the matter.

### WHAT WAS THERE IN PLACE OF THE EARTH BEFORE THE EARTH WAS FORMED?

Astronomers are not quite certain as to the details of the matter that existed in space before the earth was formed, and that gradually turned into the earth. This matter, indeed, probably passed through various stages rather different from each other. The simplest view, and one which is almost certainly true in the main, is that the last stage passed through before the earth was formed was that of a mighty cloud of glowing gas. It must have been very hot, for we have proof of that in the rocks, and in other ways; and as it was hot, it must have occupied a great deal of space. The earth upon which we live now is very small compared with that globe of gas, but, on the other hand, it is very much denser—for the earth has been steadily shrinking for countless ages, and we know that it is shrinking still. We may ask how it was that this great globe of gas came into being. We know that it did so by separating itself from the great mass of which the remaining central part is our sun. The other planets were formed in the same way, and so we find the same matter in the earth, and in the other planets, as we find in the sun. This globe was a little sun, indeed, as the great hot planet Jupiter is still; it was so hot that it must have given out light of its own.

### WHAT HAPPENS TO THE LIGHT WHEN IT GOES OUT?

We have to think of light as a kind of energy, a kind of disturbance full of power that is made in the ether. It is a thing that travels at a tremendous speed, and it is not capable of being still. When we have a steady light in a room, it is not that there is something in the room called light which is staying there, but that from every millionth part of a second to every next millionth part of a second new light is being steadily made. So we cannot keep light in a room as we keep anything material. If, for instance, we take a heap of sand into a room and then, putting it in a heap on the floor, do no more, it stays there until something removes it; but light stays nowhere, it is always moving; and if there is to be steady light in any place, there must be a steady source of light to produce it from moment to moment, or it will cease.

When we darken a room we cut off the source of light, and the light which was made an instant before is gone. Now we see why. But this question is a most important one, and people often forget to ask it. Nothing is lost, and the energy or power that made the light is not lost, even though the room is quite dark. If we could trace it we should find that it had been transformed into other things; it is transformed into heat, which we find in all the matter which it strikes—and this includes not only the furniture and walls, but also the air of the room; it is also changed into the power which starts chemical changes, as, for instance, when carpets and curtains gradually fade under its influence.

### DOES A FALLING STONE DROP QUICKER AS IT NEARS THE GROUND?

The answer is "Yes." If falling things did not fall quicker as they fell, it would hurt us no more to fall five hundred feet off a high cliff, or to fall thousands of feet from a balloon, than to fall to the ground when playing a game. The farther a thing falls, the more quickly is it moving when it reaches the ground, and the greater is the force with which it strikes the ground. If there were nothing to resist the fall of objects, there would be nothing to prevent this increase in speed getting greater and greater; but there is always the resistance of the air, and in the case of the fall of raindrops, that is sufficient to hold them back. If it were not for this, a raindrop falling on our head might fall with such terrible force as to kill us. The proper name for the increasing speed of a falling body is *acceleration*, and we shall remember not to spell it with two "l's" if we know that it comes from the Latin celer, *swift*. The acceleration due to the pull of the earth, which we call gravity, is the same for all falling bodies. It is not greater for a heavier thing than for a lighter. Galileo showed this when he dropped two balls, one light and one heavy, from the leaning tower of Pisa, and they reached the earth at the same moment. The amount of this acceleration has been precisely measured. It is 32 feet in every second of time—that is to say, the falling body in each second falls 32 feet more than it did in the second before.

### HOW FAR DOES A STONE FALL IN THE FIRST SECOND?

We know exactly the answer to this question. We might think at first, if we read the answer to the last question, that the stone must fall 32 feet. But 32 feet is the amount of increase in the rate of its falling at the end of a second, and at the beginning of the second the stone was not moving at all. Therefore, its average rate of movement throughout the second is midway between no movement at all and 32 feet—in other words, an average of 16 feet per second. That is what we find; at the end of a second the stone has fallen 16 feet.

### WHY DOES A PLANT DO BETTER IN A POT THAT HAS A HOLE IN THE BOTTOM?

A plant, like every other living thing, must have water. A plant does not take in water by its leaves or stems, but only by its roots. When we water a plant from above, the water has to sink into the earth until it reaches the roots—and we may forget to water it! But if the pot has a hole in the bottom, and stands in a saucer filled with water, the water soaks through the hole just to where it is wanted—the part where the roots are. So it is carried up through the plant, and at last given off by the leaves. Plants must have water running through them, and so must we. In them it mostly runs upwards, and in us it mostly runs downwards. It is probable, also, that a plant would do a little better in a pot with a hole in the bottom than in one without a hole, even if it were not fed with water in this way, for at least the hole would provide for ventilation, and the plant needs a constant supply of fresh air as much as we do. Growing in the earth, it gets that, but in a pot made of something through which air can pass only very slowly, the plant's ventilation is rather interfered with.

### WHY DO WE NOT GET ALL WE WANT?

Some people do get all they want, at least for most of their lives, though the time comes for almost everybody when he wants to get well, and cannot. Now, if we study what happens to these people who get everything they want, even without having to work for it, we find that it is very bad for them. It is quite certain that we, and every part of our bodies, and every power we have, are naturally meant to work, to fight against difficulties; and it is better to fight, even if we do not conquer, than it is not to fight at all. One of the reasons why history records so many wicked and degraded kings is, that these were people who, all their lives, got everything they wanted. Every living creature that gets everything it wants given to it without striving is apt to become weak and degraded.

Many sensible grown-up people who have lived careful lives, and have had a fair chance in the world, know that they do get all they *really* want. No doubt they would like to have more money than they have, or, if they are a higher kind of people, more wisdom than they have; yet they know that if they work they will get enough for their happiness, and if wise people have that, they do not worry themselves by wishing for more. Children do not know what they can get, and what they cannot get. So all children, more or less, cry for the moon, as we say, not knowing how far away the moon is. As they grow up, they learn that it is not worth while to worry about things they cannot have, but that it is much better to work hard for the things they can have.

### WHAT IS IT MAKES US FEEL HUNGRY?

Most people confuse some very different kinds of things together, and call them all hunger, but that is a very bad and a very serious mistake. When a man has had a good dinner, and has perhaps eaten more than he should, and then eats a chocolate, or drinks a glass of liqueur, or takes a crystallised fruit, he is doing something which may, or may not, be quite harmless; he is taking something that he likes, but what prompts him is certainly not hunger. We eat and drink a great many things at meals, and between meals, just because they are pleasant to our senses of taste and smell. These senses like to be pleased, just as our other senses do; but we no more satisfy hunger by taking a pleasant sweet because it has a nice taste and smell than we do by listening to singing.

Real hunger is quite a different thing, and the place where it really is caused is not either in the mouth or in the nose. A person who is really hungry will eat dry bread, or tasteless oatmeal porridge, without milk, cream, or sugar, and he will find it delicious. Real hunger is a state of the blood. The blood has used up much of its food material, and needs more. As it passes through the brain, the brain—which is where we feel everything—finds that the blood has not sufficient food materials in it, and it sets the body asking for more. That is true hunger, and if we ate only to live, we should eat only when we had this true hunger. If we eat too much, or without being hungry, we eat to die in the long run.

### WHAT MAKES THE PUPIL OF OUR EYES GROW LARGER AND SMALLER?

If we think of a very small, but thick, india-rubber ring, we shall understand the answer to this question. The pupil is simply the hole inside this ring. The ring itself in our eyes is not made of india-rubber, but it is elastic. It is made of muscular fibres that run round the pupil, and enclose it. The name of this ring is the iris. In front of the iris and behind it there are layers of cells which contain colouring matter, and it is these that give our eyes their colour. When we look at anyone's eye we can see this coloured muscular ring and the black hole in the middle of it. When the little muscular fibres contract, the pupils grow very small. We can see this happen in anyone if we cover his eyes, and then suddenly throw a strong light upon them. We may see this, too, in a person who has taken too much opium, for opium makes the iris contract very strongly, and so a person under its influence has "pin-point" pupils. In the darkness the iris relaxes and stretches, and then the pupil gets very large. Foolish people sometimes drop belladonna into their eyes, since this drug poisons and paralyses the iris, and the pupils get very large and the eyes look brilliant. But the eyes suffer, for they cannot now protect themselves from a bright light by shutting off part of it. The use of this beautiful arrangement is to regulate the amount of light falling into the eye. If we go into a darkish room straight from the sunlight, we can see nothing. In a few moments things become visible. The reason is that our iris has relaxed, the pupils have become larger, and more light is entering the eye.

### WHAT IS THE LOOFAH SOMETIMES USED IN THE BATH?

The loofah looks like a stiff, fibrous piece of netting, and because it is tough, not brittle, it makes a capital thing to use for a good brisk rub when we are bathing. But it is not made by hands. It is the fruit of a plant, and belongs to the same family as the cucumber. The cucumber is not fibrous, or we could not eat it, and the loofah, or luffa, differs from it in this respect. Of course, the loofah is not, in its natural state, like the loofah of the bath-room. The loofah that we use is simply the fibrous skeleton of the cucumber, or gourd, that grew in Egypt. After the fruit has ripened it is dried, and the fleshy part disappears, leaving only the fibres, and these are so strong, and stand the action of water so well, that a loofah lasts quite a long time. There are about ten species of loofah, and one sort, grown in the West Indies, is used as a sponge or dishcloth.

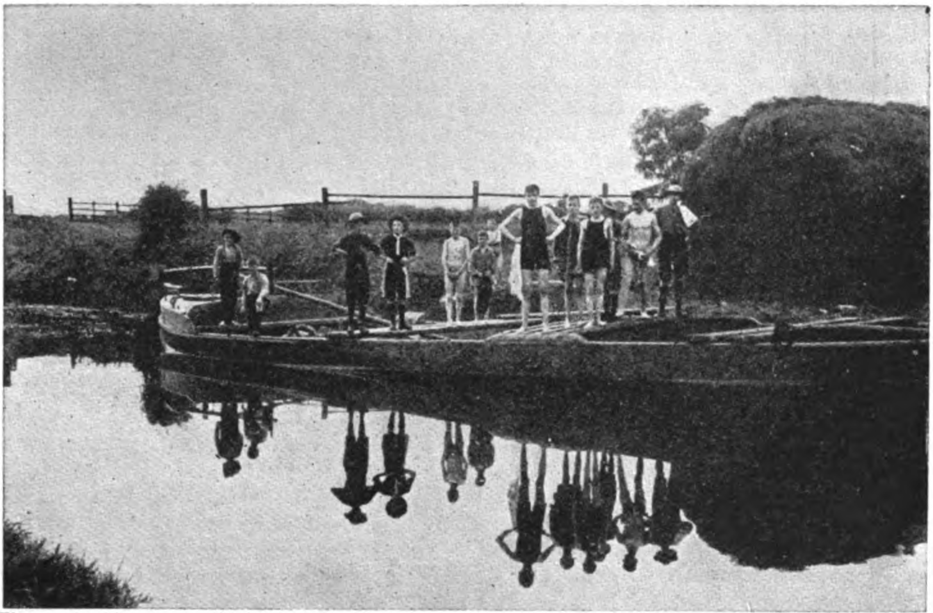
### WHAT MAKES SHADOWS AND REFLECTIONS?

Both shadows and reflections depend, of course, upon light, but they are very different things. Everything we see, except the light of a candle, or the sun itself, or some other luminous body that gives out light of its own, is a reflection—that is to say, what we see is the light reflected from the surface of the thing. Now, a shadow may sometimes look like a reflection, and people sometimes mix up the two words, but there is a great difference. In the picture on page 3435, of some boys on a wherry, what we see is the reflection of them in the water. If the sun were behind the boys, then their bodies would interfere with the rays of light as they approached the water, and the water would show shadows which might be of just the same shape, or almost the same shape, as these reflections are. There is nothing difficult to understand about a shadow. Of course, the whole of these shadows would be quite dark, unless there was some part of the boys that was transparent and let the light through. What we see in the picture are not shadows, because, for instance, the white tie of the fourth boy from the left is shown white in the water.

What has happened here is that the light, striking the front of the boys, and coming off from them in straight lines in all directions, has been reflected from the surface of the water, which must have been perfectly still like the surface of a mirror. There can have been no wind when this photograph was taken. In such a case water may be a very nearly perfect mirror. Yet it is not perfect, for some of the light passes through the water, and is there absorbed instead of being thrown back, or reflected, to our eyes. So, at all points, the reflection is less bright than the images of the boys themselves. If the water had thrown back perfectly all the light sent to it, there would not be this difference. Let us compare, for instance, the whiteness of the boy's tie and the reflection of it in the water.

**WHAT WAKES UP THE BIRDS?**

Sleep is a very mysterious thing that we do not know much about yet, but at any rate we are certainly mistaken when we think that sleeping creatures only wake up when something arouses them from outside. It is possible to study the exact amounts of noise that will wake people at different parts of the night, and we know that as morning approaches, healthy people or animals sleep less and less deeply, so that things wake them which would not have wakened them in the earlier part of the night. Healthy creatures probably either wake up quite apart from anything outside them, and because their brains have now rested long enough and are ready to start work again; or else their brains are just ready to wake up with the least thing, and some little noise or light—it does not need much then—gives the necessary signal.



The sun is shining upon the front of these boys, and so we see their reflection in the water, as the white tie of one of the boys proves. If the sun were behind them it would be their shadows that we should see in the water.

So we may say, and it is perfectly true, that it is the light which wakes the birds, just as it is the dark that sends them to sleep. We know that during a total eclipse of the sun, when it gets dark in the daytime, the birds fold their wings and start to go to sleep. Of course, they very soon find out that they were wrong. But though the light of dawn, or perhaps the voices of other birds that have awakened a little sooner, seem to do the waking of the bird, yet we must understand that waking and sleeping, in all living creatures that wake and sleep, really depend, not on what is happening outside, but on changes that go on steadily to and fro inside the creature in question, especially in its blood and brain.

### ARE THERE ANY PEOPLE IN THE OTHER WORLDS?

This is a great question, to which no one can return a certain answer, and about which many big books have already been written and many more will be written. But something we can be sure of. People sometimes talk as if there could be *men* on other worlds, but we may be sure, when we think of the wonderful way in which men are adapted to this earth of ours, to its air, and water, and climates, and food supply, that there could be men like ourselves only on a world *just like ours*, and we certainly do not know of the existence of any such world. Those we know all differ greatly from our earth in all sorts of most important things, such as the composition of the air. *Man*, then, is a child of earth—this particular earth of ours; he is exquisitely fitted for it, and it for him, not only in its air, and soil, and oceans, and heat, but also in the kind, and the balance, as we may say, of the thousands of animals and plants that inhabit it with him. We are certain that men and women and children like ourselves could be found only here, or on some other world, unknown to us, which is an exact double of our earth. Such a world is quite unlikely to exist anywhere.

### IS IT POSSIBLE THERE MAY BE LIVING CREATURES ON OTHER WORLDS?

This question is a very different one indeed from the last, and we need have no doubt at all that the answer is " Yes." To begin with, it would surely be very extraordinary, would it not, if *life*, which is the highest thing we know, and with which earth, and air, and sea are crammed, were confined, in this mighty universe, only to our little earth; if all the other worlds, big and little, far and near, were *dead*, and only rocks or glowing fires?

Then, again, we know that other worlds are made of similar materials to those that make our own earth, and we are sure that the laws of matter and chemistry apply everywhere, so that if life could be developed on our earth, it might be developed on many worlds. Further, we know that life has an endless power of fitting itself to outside conditions. Life flourishes on our own earth in extreme cold and great heat, on almost dry rock, and in the depths of the sea. So he would be a rash man who declared that life could not find, on other worlds, conditions fit for it to develop in. More than this, we have some hints—and more than hints—of real evidence that life exists on some other worlds, such as the moon and Mars.

### ARE THERE MEN ON MARS?

The answer to this must certainly be "No," as astronomers have shown us that Mars is very different from the earth in many ways. It is smaller, so that the power of gravitation is less; it has very little water; its heat is probably very different—perhaps much hotter than the earth by day, and much colder at night; and it has not much of an atmosphere. For these, and a host of other reasons, any living beings on Mars must be vastly different from men in a number of ways. But, on the other hand, we can see on the surface of Mars markings which must almost certainly be due to strips of vegetable life, and it has just been proved that water exists on Mars, though this used to be denied. Also, we know Mars has an atmosphere, though one very different from ours.

### CAN THERE BE ANY KIND OF INTELLIGENT LIFE ON MARS?

It is almost certain that there is life of some kind on Mars, and some people believe there are thinking beings on Mars—not men, yet beings who might understand men, and whom men might understand when they got to know each other's way of expressing themselves.

Some people who have given their whole lives to the study of Mars are quite certain that there are marks upon its surface which only intelligent beings could have made, and are even sure that all the " Martians " must be one great family who live in a friendly way, and have given up fighting each other as men still do, for the marks on Mars, it is thought, could only have been made by a race of beings who had given up wars, and frontiers, and quarrelling, and worked all together for the good of all. Perhaps the children who read this answer may live long enough to learn for certain what is the truth about the "canals" of Mars, and how they came to be made. There is scarcely a more interesting question in the world.

### WHAT IS THE USE OF THE PLANETS THAT HAVE NO LIFE ON THEM?

No doubt some of the planets have no life upon them, and no doubt life is the highest thing that can happen on a planet. But we have every reason to suppose that life will develop at some later date upon the planets, such as Jupiter, which are now too hot to bear it, just as our earth once was. So we might say that these planets are preparing for the "use" of bearing life. There may be other planets which are now too cold, but once had life upon them; and there may be planets which never had and never will have life upon them. We human beings may, perhaps, be able to make use of them by watching their movements in the sky, and that is all. But, though they are of no use, or little use, to us, perhaps they have a use and a meaning for their Maker.

### WHAT IS THE USE OF STARS THAT ARE TOO FAR AWAY FOR US TO SEE?

People have tried the hopeless task of proving that even the stars which are too far away for us to see have some use for mankind—that perhaps they send us some kind of radiation which is useful for our eyes. There is no proof of this, and nothing is less likely. Probably the use of the stars which are too far away for us to see, and the use of the stars which are not too far away for us to see, are the same as the use of the star which we can see best, and which we call the sun—to support and nourish life in their neighbourhood. And if there are stars which have no such use, and which certainly might not exist for all the difference they make to us, yet there are more uses and purposes in the universe than we can guess or dream of.

### WHY DO WE WANT TO WALK SLOWER UPHILL THAN DOWN?

When we walk on the level we have only to work against such things as the resistance of the air, and the weight of our legs as we lift them up and down. When we walk downhill, less effort is required on our part in some ways because, in walking downhill, we are to a certain extent falling—that is to say, we are being pulled nearer the centre of the earth. Yet in course of time, especially if a hill is very steep, it may be very fatiguing to walk down it, because we have to balance ourselves so carefully. This is owing to the strain on our toes pressing against the inside of our boots, and the half-conscious fear in our brain that we may be pulled down too quickly and hurt ourselves. When we walk uphill the work is very hard, because then we have, by sheer muscular effort, to lift our whole bodies away from the centre of the earth in defiance of gravitation. We have to exert in the opposite direction a greater force than that of gravitation.

### DO WE USE UP MORE ENERGY IN WALKING UPHILL THAN ON THE LEVEL?

The difference can be measured in such cases, and it is said that to walk up a steep hill at a given pace costs us more than twenty times as much effort as to walk at the same pace along the level. No wonder, then, that we want to walk slower uphill! The reason is really exactly the same as the reason why we lift a heavy weight in our hand more slowly than we let it down. In one case we are pulling against gravitation, and exerting a greater force than gravitation; in the other case we are only exerting a comparatively little force against gravitation so that the weight shall not fall down to the ground too quickly.

This difference—whether we walk against gravitation or with it—shows in another way. It is not much use for a stout man who wishes to get thinner to walk on the level. Let him walk uphill, and he will soon find that he requires to burn away a lot of his fat to provide the power that will lift his body against the earth's pull.

### WHY ARE WE GIDDY WHEN LOOKING DOWN FROM A GREAT HEIGHT?

Everyone does not become giddy when looking down, and anyone who is in good health can learn in time by practice how to look down from a height without turning giddy. There are two explanations of this giddiness. One is the general explanation that the fear of falling disturbs the working of the brain. Now, our sense of being balanced, and our feeling that we are able to balance ourselves, depend upon the proper working of the brain; and so the fear of falling may make us giddy, just as giddiness may be caused at times by other kinds of fear.

But people who are not in the least afraid, or who did not at all expect to be afraid, may turn giddy when they look down from a height, and there is a very interesting explanation of this. Part of our power of balancing ourselves depends upon vision. We know how one is apt to bump against a companion when walking at night, for instance. And even though we can balance ourselves without the aid of sight, yet we are very apt to feel giddy if our eyes play us any tricks, and that is what they do sometimes at a height.

### WHY, WHEN WE LOOK FROM A GREAT HEIGHT, DO THINGS SEEM BLURRED?

As a rule, anything we look down to see is quite close to our eyes—a few inches when we are reading, for instance, or a few feet when we look at the ground; and it is the rule that when we look at anything near, our two eyes turn inwards towards each other slightly, or converge, as we say. The eyes are so accustomed to converging when they look downwards—as the things they look down on are usually near, and as the two eyes cannot see a near thing well unless they converge slightly in looking at it—that they do the same when we are on a height, and perhaps the nearest thing is the ground, hundreds of feet below us.

In order to see a thing so far away, our eyes should look straight out, parallel with each other. But until we have learnt to go on high places, the eyes converge, and so are bound to give us a blurred view of the ground. Then we feel that we cannot see properly and become frightened and giddy This is what students of the eyes believe, but we ought really to make experiments with people who hold the hand over one eye when they go on high places, and to see whether they feel more comfortable when they do so.

### HOW CAN PLANTS GROW ON A BARE WALL?

One of the most important parts of the food of green plants is found, as we know, in the air. That is the carbonic acid gas, which provides the plant with its carbon. But that, of course, is not all. The plant must have water, and it must have salts. Now, a bare wall is not as bare as we think it, when we come to examine it closely. In the first place, rain falls upon it, and so the plant gets its water. Nor is this all. Rain itself contains minute quantities of salts which are valuable to the plant; and as it trickles down the wall, it gains more. It has the power of melting, out of the wall, salts that may be contained, for instance, in the mortar. We know that lime is very valuable for plants, and mortar is really a kind of lime. So we find on examination that plants can obtain, even growing on a bare wall, those things that are necessary for their life. But, of course, the supplies of certain essentials are very scanty, and the forms of plant life which can grow in this fashion are very humble, and never reach a large size. Very different is the case of the plant that grows over the bare wall, but has its roots in the earth, from which it draws nourishment.

### WHY DOES THE BOOMERANG COME BACK?

Some people suppose that the boomerang comes back after hitting what it is aimed at. That would really be very convenient indeed when the instrument is used in the chase, but it does not happen. The first part of the boomerang's path is straight, or practically straight. It is expected to hit its object while it is in this part of its path. If the boomerang were flying through nothing, it would have to fly *always* in a straight line, according to Newton's great law of motion.

But the boomerang is flying through air, and it is so shaped that the air resists one part of it more than another, so that it has to travel in a curved path after its speed has slowed down below a certain rate. As it travels in a curve, it *more or less* comes back to the place it started from. Endless study has been devoted to finding why the boomerang must be its exact shape, what are the consequences if its shape is a little different, what is the speed at which it begins to curve, how its weight and size affect the curve, and what is the relation between the curves of the boomerang itself and the size of the curve it makes in the air. But these questions are immensely difficult, and still undecided. If the boomerang, instead of being *gradually* slowed down, is arrested entirely in its flight, as when it hits something, it simply drops "dead," as we might say. Perhaps the most wonderful thing about the boomerang is the fact that it has been brought to perfection among the natives of Australia, who are almost the lowest race of mankind.

The next Questions are on page 3539.

# A SECOND TALK ABOUT TREES

## WHAT TREES HAVE DONE FOR ENGLAND

CONTINUED FROM 3406

When we enter a great building like Westminster Abbey, we are so surrounded by the magnificence of masonry that we are apt to forget the wooden doors which let us in. Those wooden doors close at night; the lock is turned; they guard the abbey; they shut out the world; the mighty dead rest safely in their graves because of them. The forest guards the rock.

How the brain works, looking at those old carved and nail-studded doors, and thinking of the day when they grew in some English forest, their roots hidden underground, their branches swaying in the wind, their leaves making a pleasant rustle in the summer air! Birds built their nests in them long before the Wars of the Roses. The woodpecker tapped at their bark long before Shakespeare walked from Stratford across the fields to Shottery St. Mary. Squirrels ran along their boughs while the Normans marched through the land. They will be hanging there when you and I, and our children's children, have passed away for ever from this earth!

Those old doors of the abbey! Does the sacristan ever think, as he turns the great key in the lock, of the many men who have fastened those doors before him, and who are now dust of the earth? Does he ever realise that he is handling the woodland of the Angles? Does he sometimes think that he hears the sap rising, that he feels the chequered shade of leaves on his face, that he sees birds building their nests in the branches? Not he. This good man has but one business with those doors—to turn the key. If he does that faithfully and well, none will find fault with him.

Someone has nobly said that it is good to look upon oaks that are kin to those immortal trees that died to live for ever as the Victory and the fighting Téméraire. Have we ever thought of that? The woodman's axe rang in the English forests. The carter came with his team of willing horses.

A sound like tearing thunder rent the air. Down fell a king of the forest. Dead? No; immortal. The carter called to his horses; they slipped and stumbled and strained in the traces; the wheels turned; the whip cracked; off went the forest king to become the Nemesis of a tyrant, the ruin of an enemy, the glory of England.

Let us read these great words:

> May the Great God, whom I worship, grant to my country, and for the benefit of Europe in general, a great and glorious victory; and may no misconduct in anyone tarnish it; and may humanity after victory be the predominant feature in the British fleet! For myself individually, I commit my life to Him that made me, and may His blessing alight on my endeavours for serving my country faithfully! To Him I resign myself and the just cause which is intrusted to me to defend. Amen. Amen. Amen.

They were written on the morning of October 21, 1805, in sight of the fleets of France and Spain, in a bay called Trafalgar. They were written by Nelson. At sea? Yes; and yet in a forest.

### THE OAKS FROM ENGLISH FIELDS THAT CARRIED NELSON AT TRAFALGAR

Oaks from English fields, under which children had played for many a generation, and at whose spreading base primroses grew all wet with April rains, formed the walls of that house in which Nelson sat writing. Were they ever more beautiful in the forest than on that immortal morning when, with crowding sail, they swept towards Napoleon's challenge, and Nelson stood there in his admiral's frock-coat with the four stars of honour on his left breast, the empty sleeve pinned near them, asking Captain Blackwood if another signal were not needed?

Captain Blackwood made answer that he thought the whole fleet seemed very clearly to understand what they were about. These words were scarcely spoken before that signal was made which will be remembered as long as the language of England shall endure—Nelson's last signal: "England expects every man to do his duty!"

Oaks of England bore him in their arms when in a divine moment of inspiration he made himself England, and spoke for England to her sailors. Can we not hear the voice of English oaks in those words?

### THE TREES OF THE ENGLISH FOREST THAT LIVE FOR EVER

Dead trees? The beautiful lichen and the glorious bark stripped off; trees no longer, but daubed with paint, black and white, hammered with nails, fastened with iron, a ship, a fighting ship of England! No, not dead trees; immortal trees; the oaks of England, the forests torn up from the soil of England and hurled at her enemies, woods in movement like the trees in the prophecy to Macbeth; yes, still trees, and trees that will live for ever. Let us read the story of that tremendous day, and ever after when we see an oak in an English forest we shall read there the name of Victory. We must remember, too, that the Dreadnoughts speed through the sea on the black wings of dead trees, which we call coal.

One likes to think, too, of the blind Milton groping his way with a stick cut from an English forest. He saw in his darkness a beam of light, which was Freedom, and he fumbled his way to it, tapping the invisible ground with his stick. Drake fought for England, Nelson fought for England, and Milton fought, too. He was one of the greatest minds that ever realised the full dignity of man, and ever hated those who would bind the human race in chains. He fought to get freedom. Is it not one of the greatest pictures in England's gallery of heroes, that of the blind Milton groping his way with a stick? One likes to think it was cut from an oak which gave Nelson his Victory and his Téméraire.

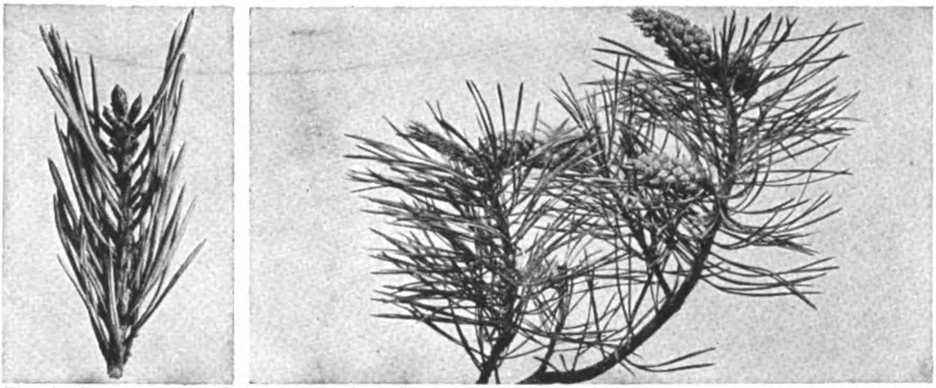
### WHAT MILTON WROTE OF ENGLAND ON A TABLE OF ENGLISH OAK

It was on a table of English oak that this great Milton wrote of England: "Why else was this nation chosen before any other, that out of her, as out of Sion, should be proclaimed and sounded forth the first tidings and trumpet of Reformation to all Europe?" And from that day forward the march has been continued throughout all fields of her national life. Across the historic table of English oak in the House of Commons has been waged the war of Reformation, the war between tyranny and freedom, between truth and falsehood, between God and Mammon.

The architect learned from the forest to build his stately aisles and arch them in with graceful roof of stone. No building of grandeur but has its roots in the forest. Man has gone there to learn how to build. He has gone there for his spears, his bows, his ships. England's long history is inseparably and for ever bound up with the forest.

FOR OTHER TALKS ABOUT TREES SEE INDEX, AND FOR THE NEXT FAMILIAR THINGS SEE PAGE 3519

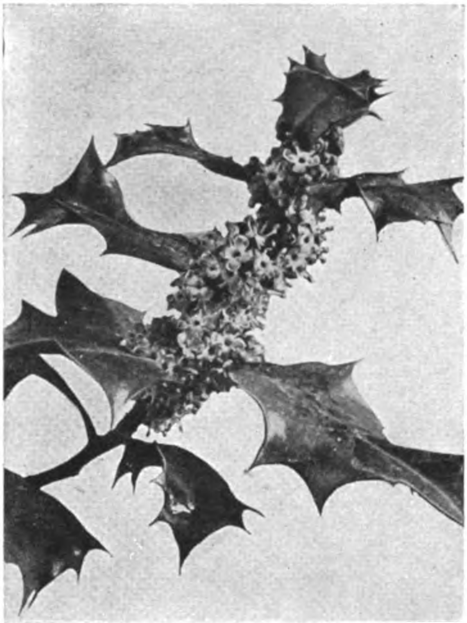
# THE NATIONAL TREE OF BONNIE SCOTLAND



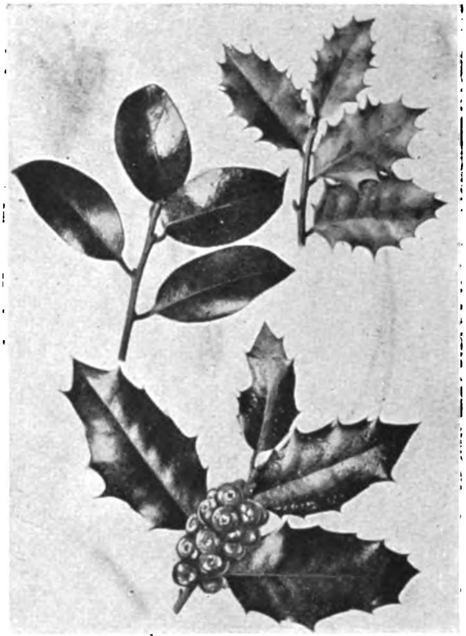
The slender leaves of the Scots pine remain on the tree for two years before they fall. In the first year they are a light bluish green in colour. which gradually changes to dark green. The fallen leaves kill other plants.

Scots pine grows in English pine woods. Its pollen, or seed, is found upon the ground in large quantities near pine woods, and looks like sulphur. When, in 1902, people found the pollen lying very thick on the ground, they **wrote to the newspapers to say that sulphur from the volcanic eruption at St. Vincent had fallen in England.**

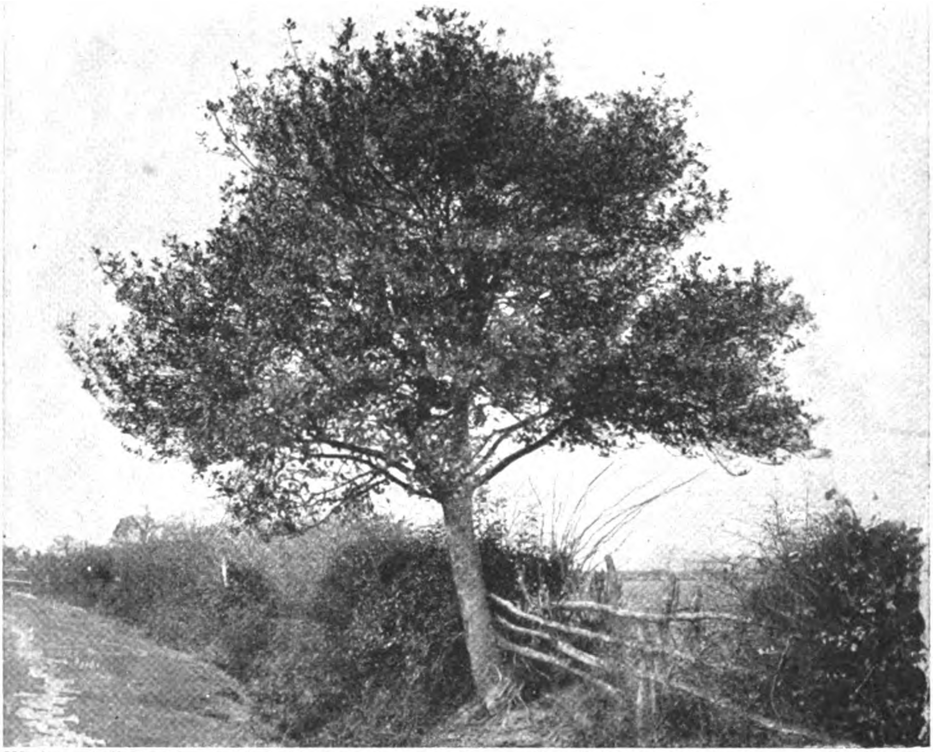
# THE HOLLY WITH THE PRICKLY LEAVES



The white flowers of holly are very small, but, like the red berries that come later, they are very conspicuous because they grow together in such great numbers.

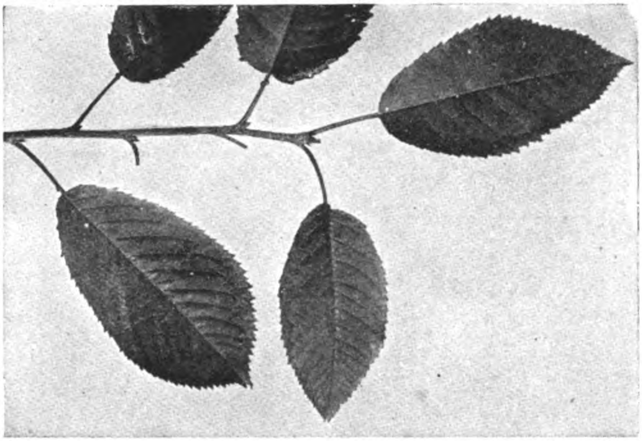


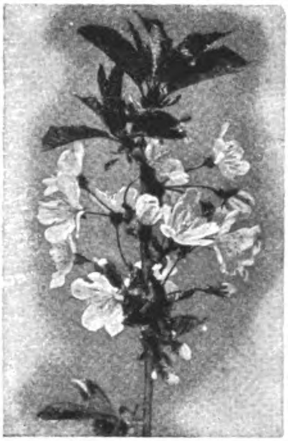
Cattle like young holly leaves, and on the lower branches the spines are developed for protection. At the top of the tree, out of reach of animals, the leaves have no spines.



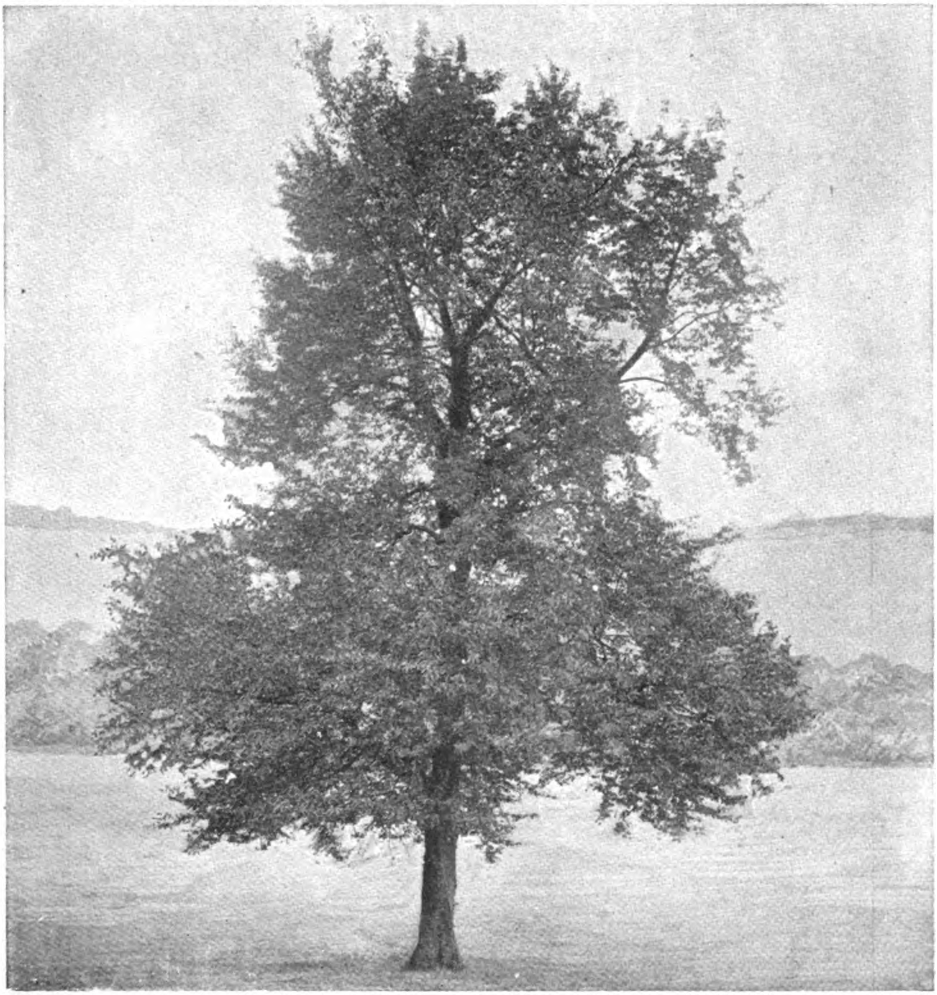
We know holly best as a bush, but it grows to a tree, forty or fifty feet high, and when covered with the rich, red berries is a magnificent sight. Evelyn, the well-known writer, calls it "a glorious, refreshing object."

# THE WILD CHERRY OF THE COUNTRY-SIDE



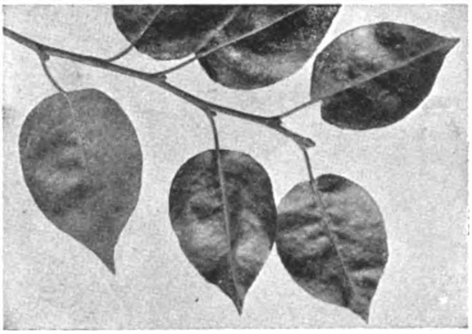


The leaves of the wild cherry-tree are a deep blue-green in colour, and grow on slender branches. When the tree is in bloom, it is covered with a mass of delicate cup-shaped flowers, that later produce myriads of cherries.

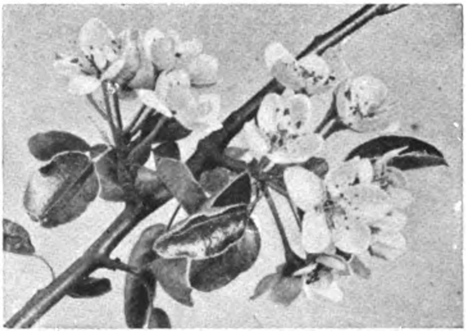


This is a fine specimen of the wild cherry-tree, for usually it grows like a mere bush. The luscious Kentish cherries of the orchards are descended from the wild cherry, which was planted all over Kent in the 16th century.

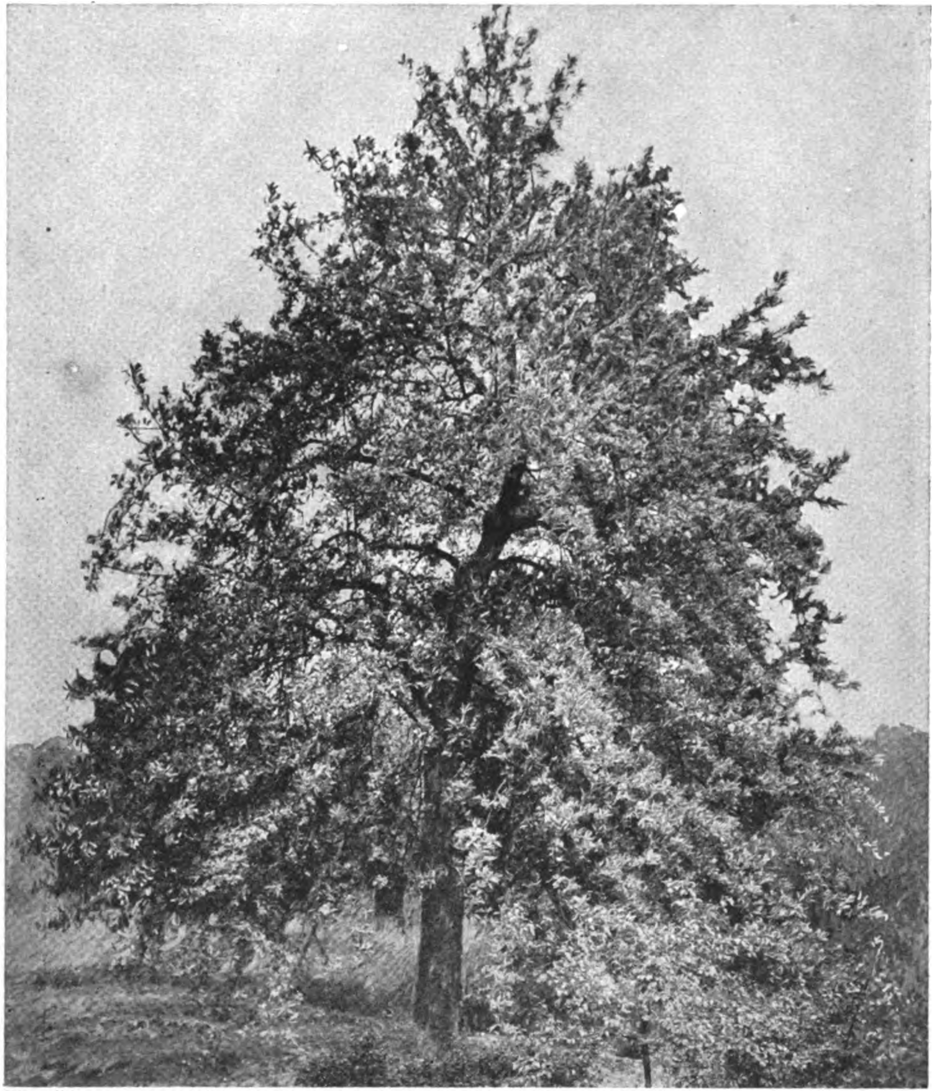
# THE WILD PEAR-TREE OF THE WOODS



The leaves of the wild pear are, in shape, very much like those of the wild apple, and their under-surface is downy.

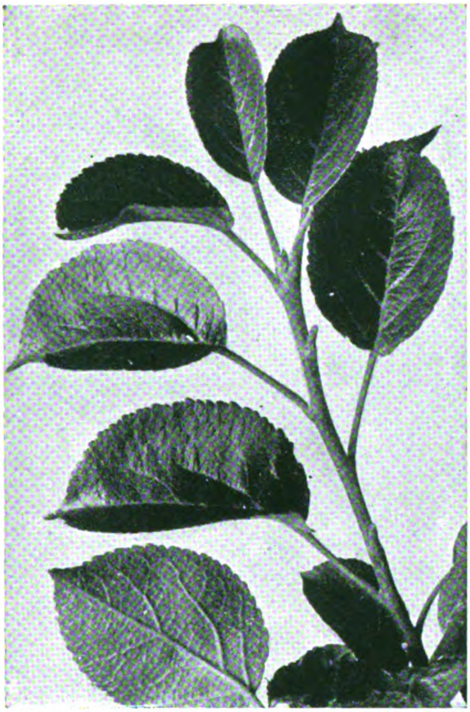


The white flowers are clustered in groups of five, and the fruit that comes from them is rough and uneatable.

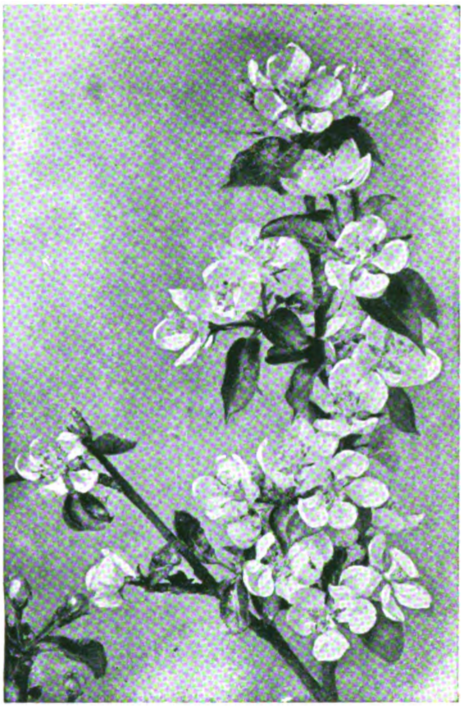


The wild pear-tree, which is the origin of all the luscious kinds of pears that we see in shops, is not found farther north than Yorkshire, but where it grows it lives long. Stained with black, the wood is almost exactly like ebony.

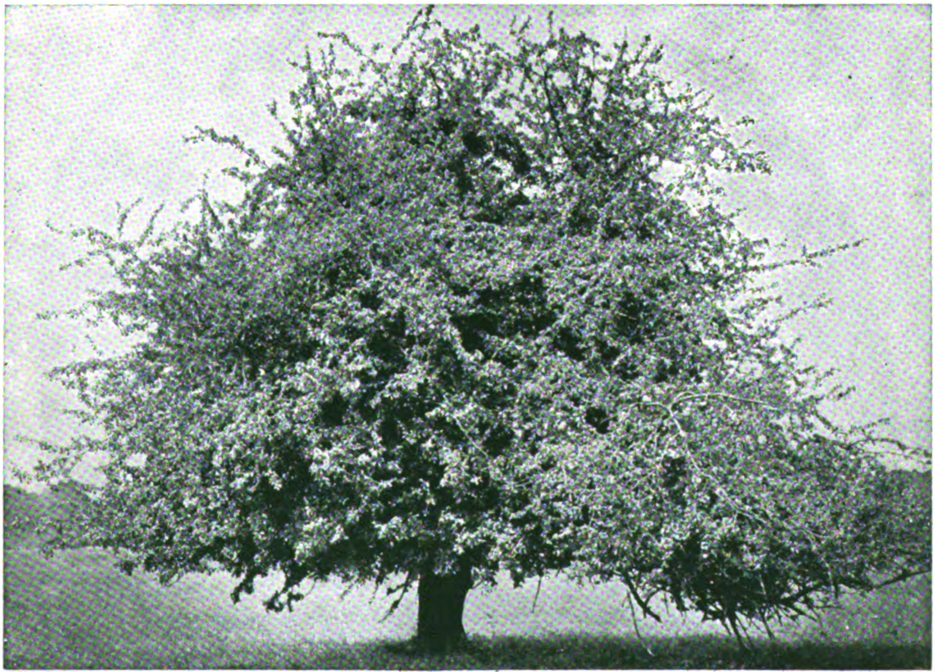
# THE WILD APPLE-TREE'S DAINTY BLOSSOM



The leaves of the wild apple-tree vary very much in shape, as may be seen here. They are smooth on the upper surface, but sometimes very downy underneath.

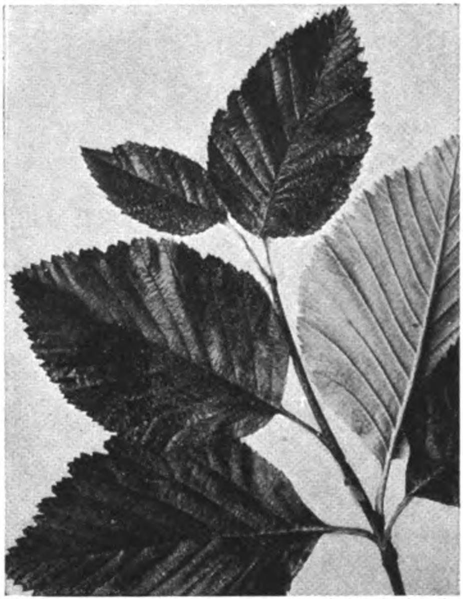


**Few flowers that grow on trees present a more beautiful sight than the clusters of wild apple blossoms, with their white petals delicately tinted with pink.**

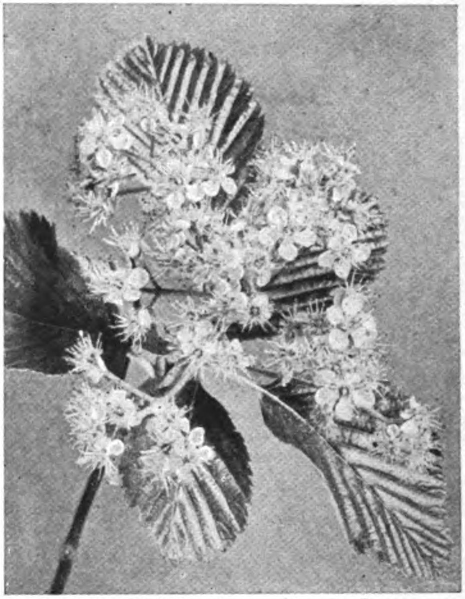


We all know the crab-apple tree, which is so beautiful in spring when it is covered with a mass of fragrant blossoms. In some parts of the country cider is made from crab-apples, and crab-jelly is a favourite country delicacy. Most of the mistletoe that grows in England is found on the twisted trunk of the wild apple-tree.

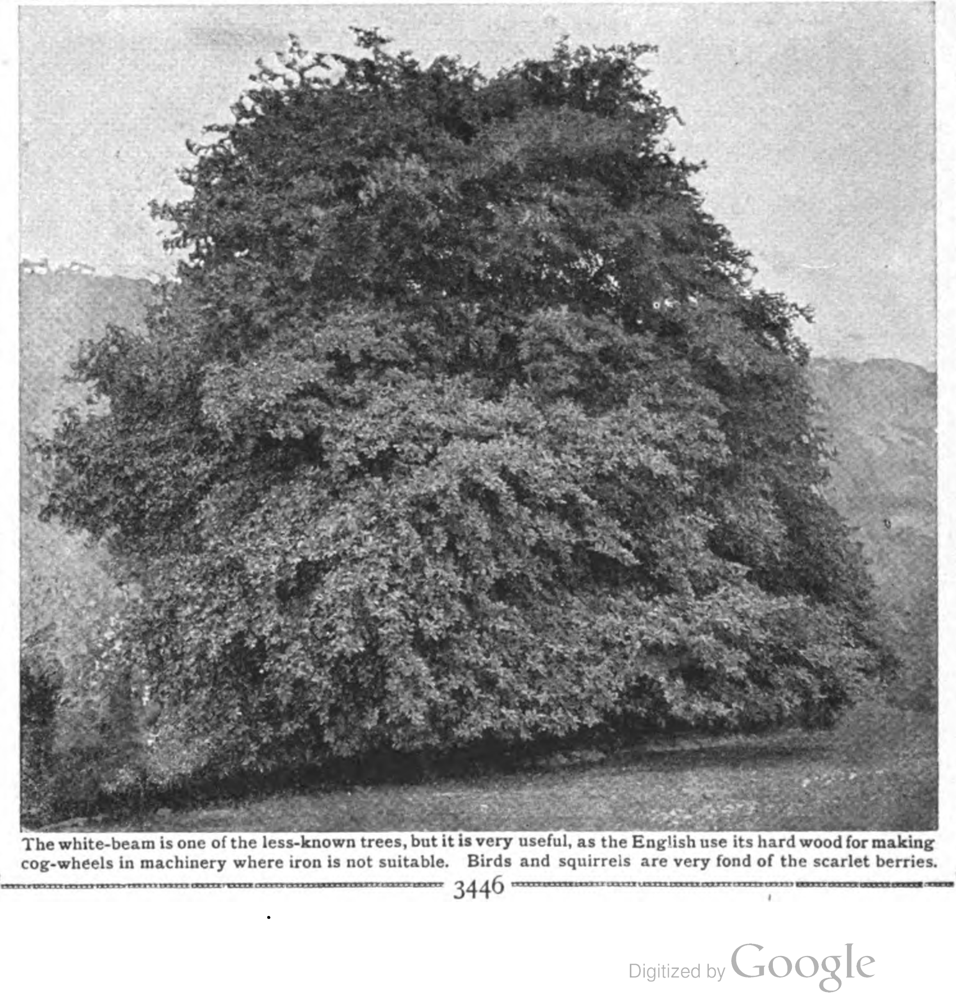
# THE WHITE-BEAM WITH THE RED BERRIES



The leaves of the white-beam are coarsely toothed at the edges, and the under-surface is covered with white down.



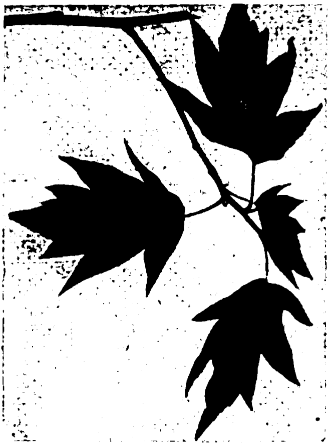
The white-beam's loose clusters of white flowers produce scarlet berries, called in the North chess-apples.



The white-beam is one of the less-known trees, but it is very useful, as the English use its hard wood for making cog-wheels in machinery where iron is not suitable. Birds and squirrels are very fond of the scarlet berries.

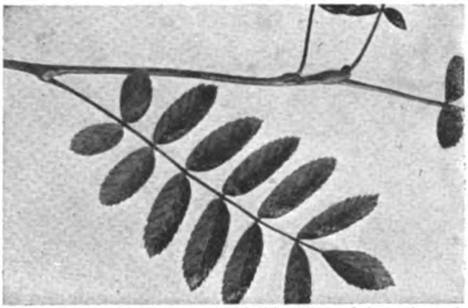
# THE WILD SERVICE-TREE OF THE HEDGE

The flowers of the white-beam on page 3446 are remarkably like those of the wild service-tree; in fact, the one blossom is often mistaken for the other. The leaves of the two trees, however, are quite different.

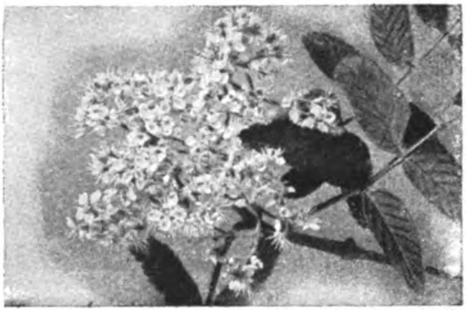


The wild service-tree is very common in the south of Britain, and is often to be seen in the neighbourhood of London. But, though ornamental, it does not often grow very high. The greenish-brown berries are sometimes sold in fruiterers' shops, for, though rough and acid when fresh, they are pleasing when mellowed by frost.

# THE ASH-TREE THAT WAS USED FOR LUCK



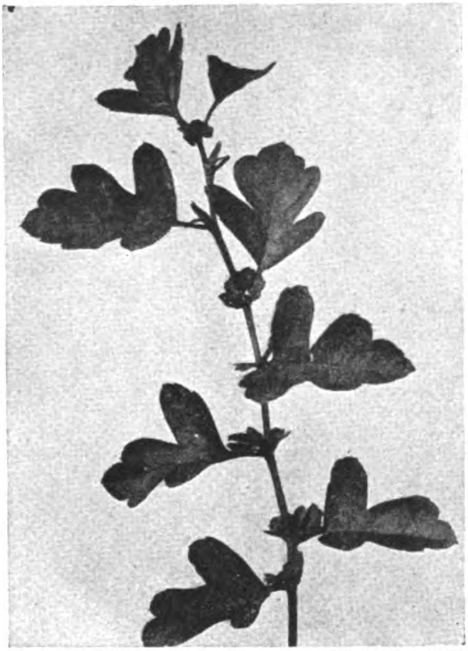
The leaf of the mountain ash is like that of the ash, and thus it received its name, but really it has no relationship to the ash. This tree was once thought to bring luck.



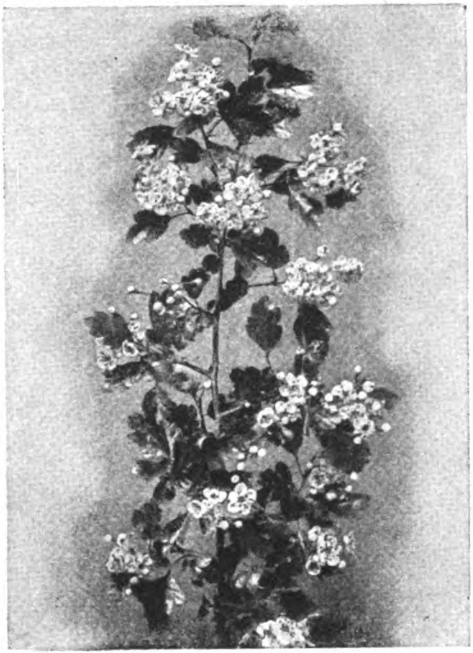
The delicate white flowers, with their fragrant smell, are like the hawthorn, only smaller, but we can see how different they are from the true ash on page 3186

The mountain ash will grow almost anywhere in the poorest soil, and it is very common in London gardens. In olden days country people used to make ale from the scarlet berries. Its other name of rowan means "charm."

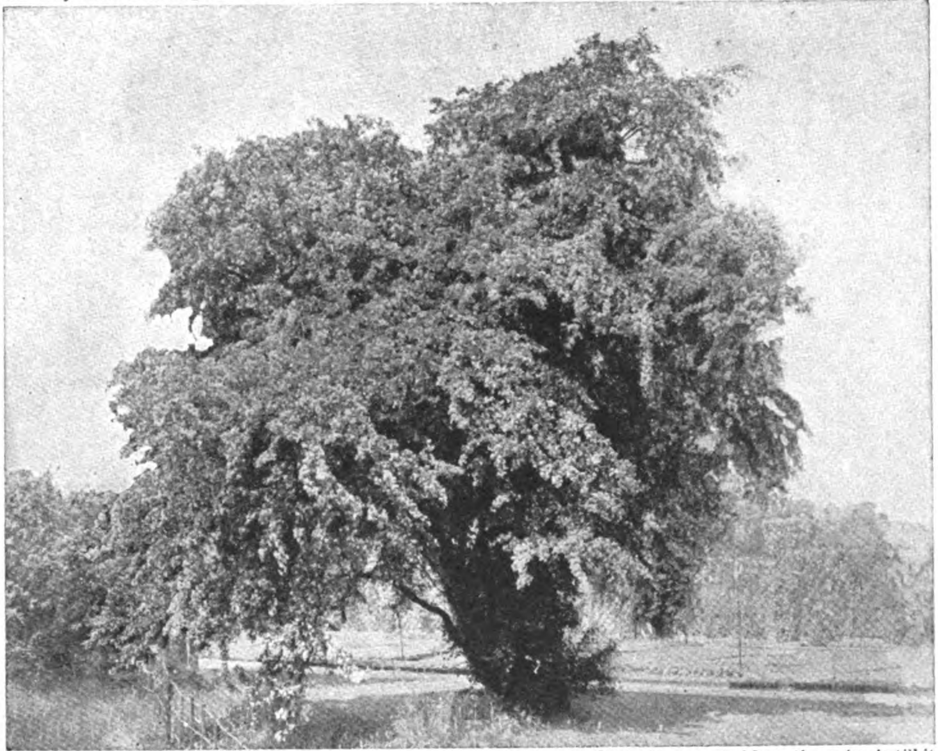
# THE HAWTHORN'S FRAGRANT BLOSSOM



Hawthorn rarely grows larger than a bush in places where cattle have free access, because the animals are very fond of eating the leaves and young shoots.

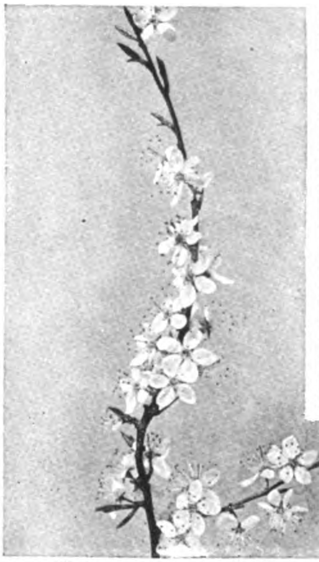


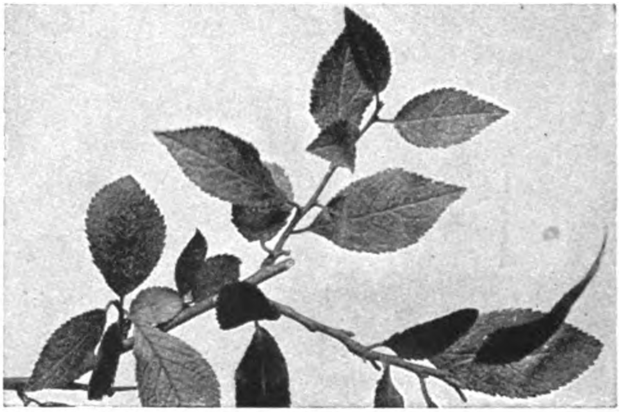
The hawthorn flower is the fragrant blossom that the English call the "may." It is usually white, though sometimes it will be found tinged with pink.



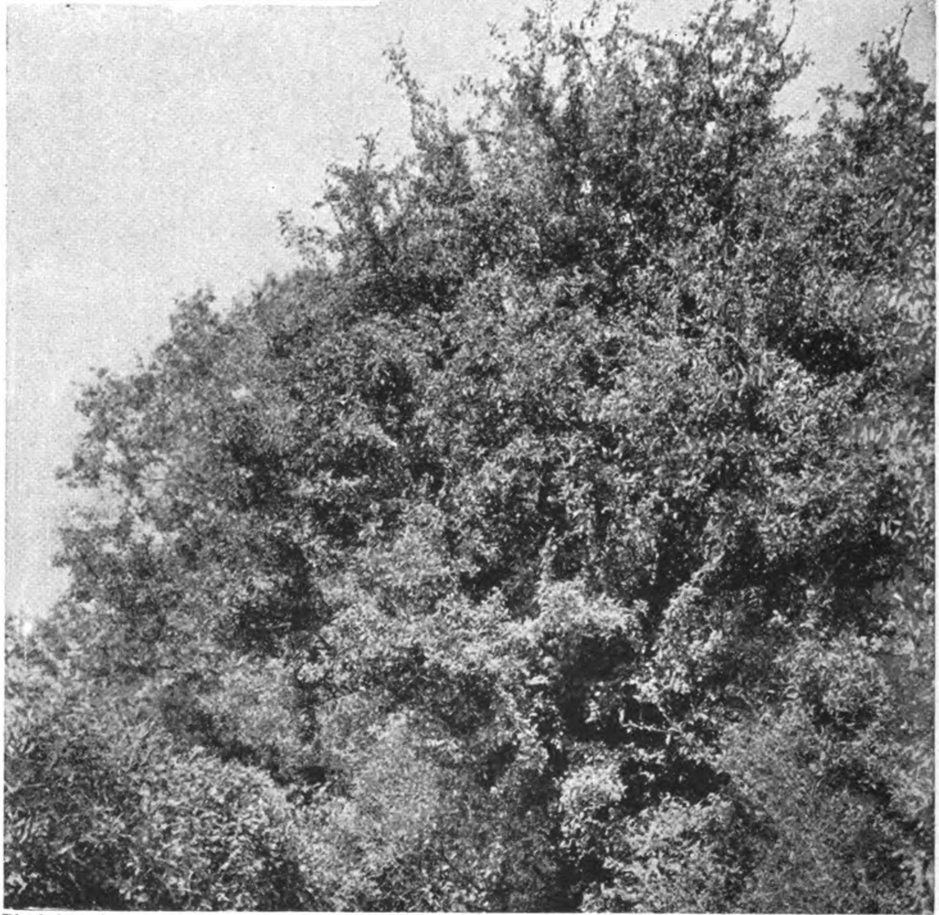
Although cattle are so fond of hawthorn, it makes good fencing for fields, if protected from the animals till it has grown to a large bush, for the branches then get very dense and the spines protect it. Otherwise, the cattle would eat the hedge and escape from the field. Hawthorn is called whitethorn because of its light bark.

# THE BLACKTHORN THAT GIVES US SLOES



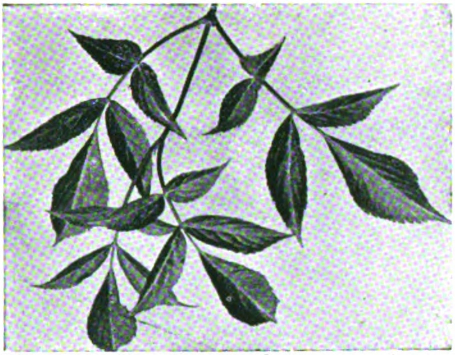


The white blossoms of the blackthorn produce the sloe berries that are used for adulterating cheap wines. Fifty years ago, when tea was dear, country people made tea from blackthorn leaves.

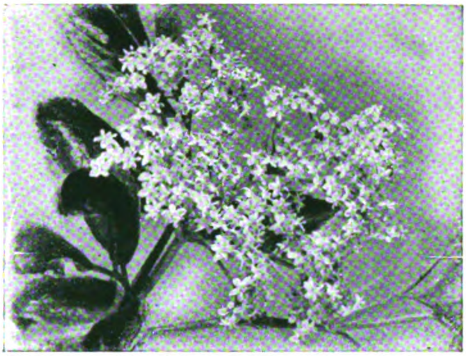


Blackthorn is not called by this name because its flowers are darker than those of the whitethorn, or hawthorn, for they are really whiter but because the bark is nearly black. Blackthorn is used all over Cornwall for hedges.

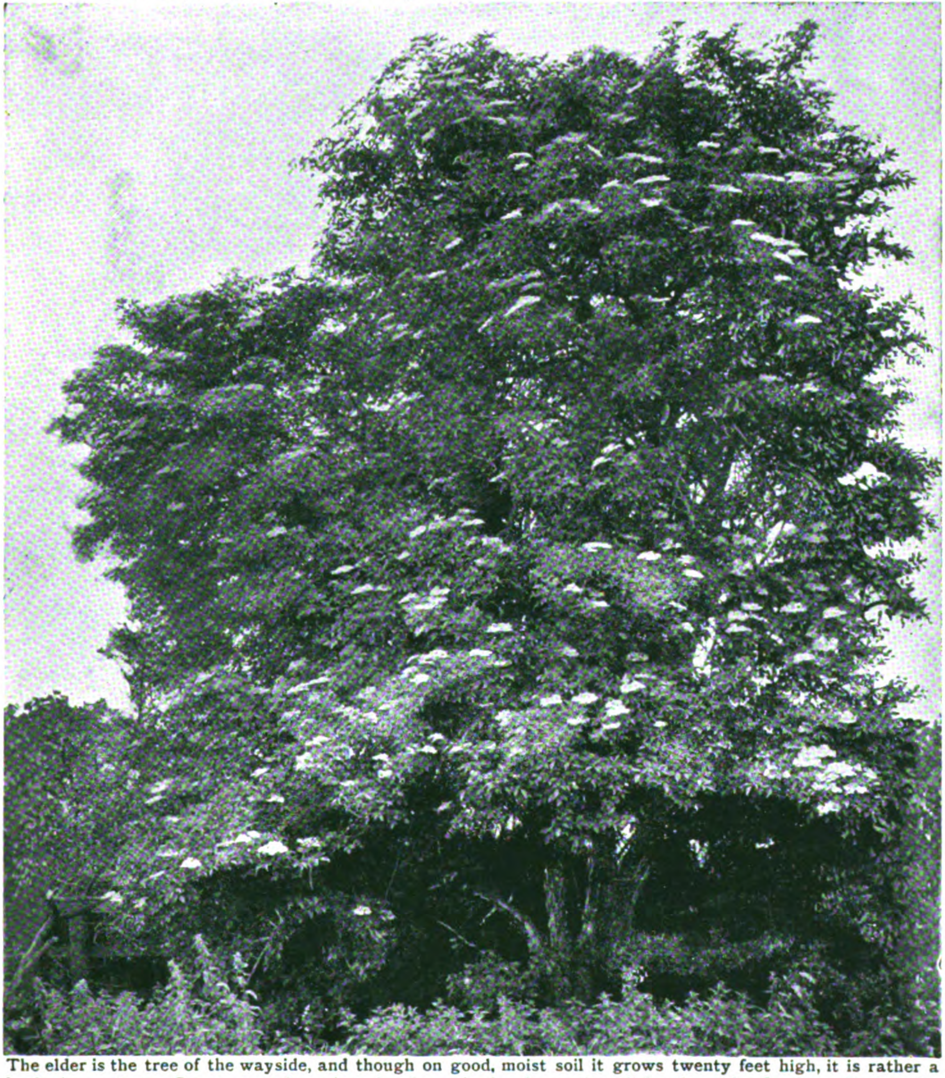
# THE ELDER, THE TREE OF THE WAYSIDE



The elder leaf is divided into five, seven, or nine oval leaflets. Here we see, not twenty leaves, but only four.

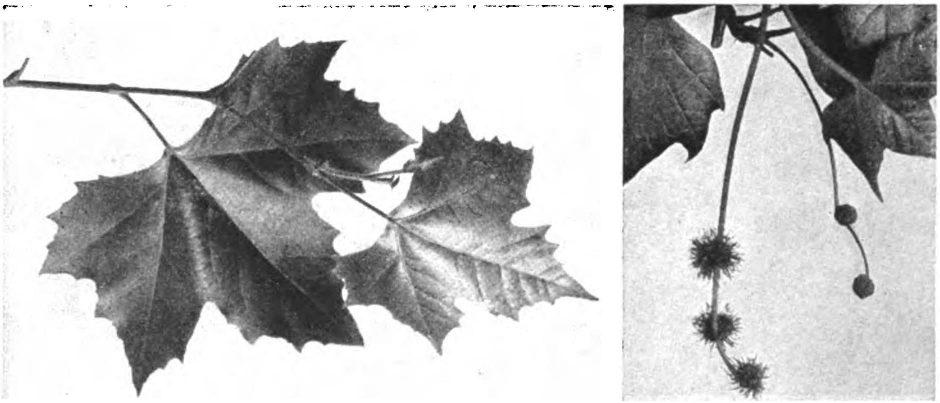


The cream-coloured flowers of the elder grow in clusters of five, and when dried they have a very pleasing odour.

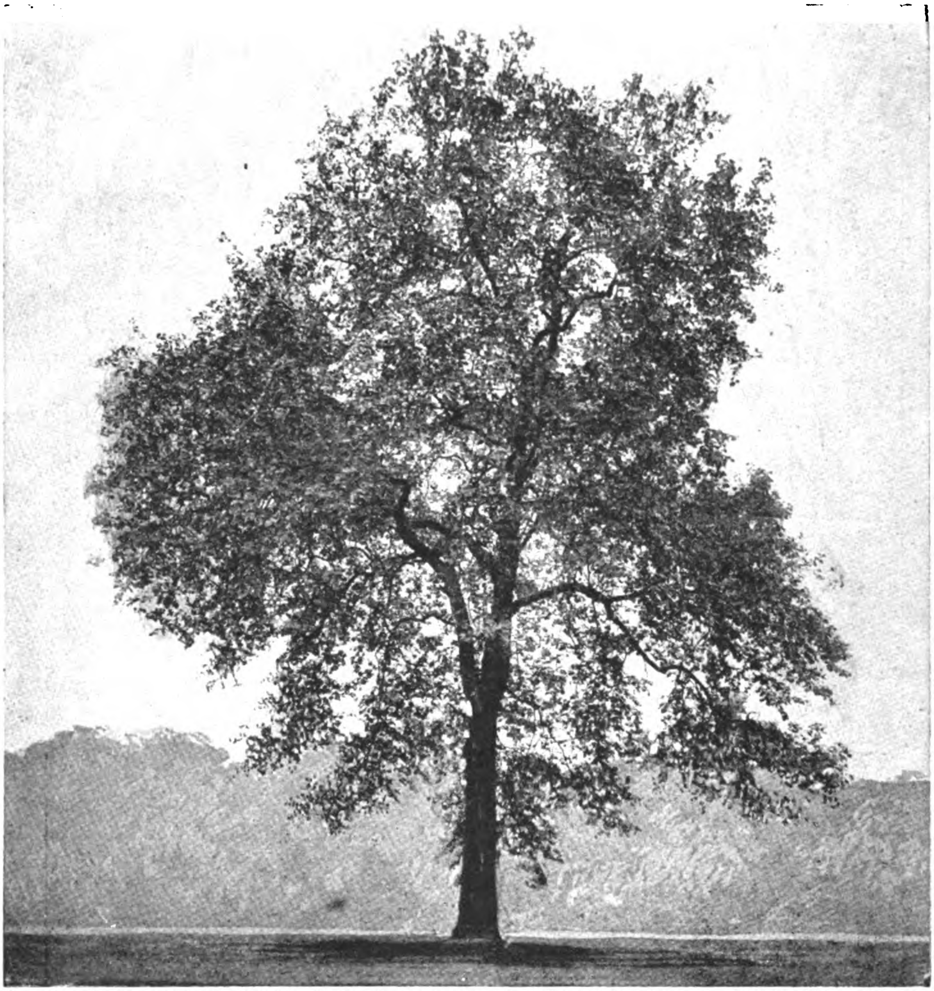


The elder is the tree of the wayside, and though on good, moist soil it grows twenty feet high, it is rather a bush than a tree. Country people make wine from the berries, and medicine from the flowers. Evelyn, the writer, calls the elder "a cure for all ills." Boys like the elder because the branches make fine pea-shooters.

# THE PLANE-TREE OF CITY AND TOWN

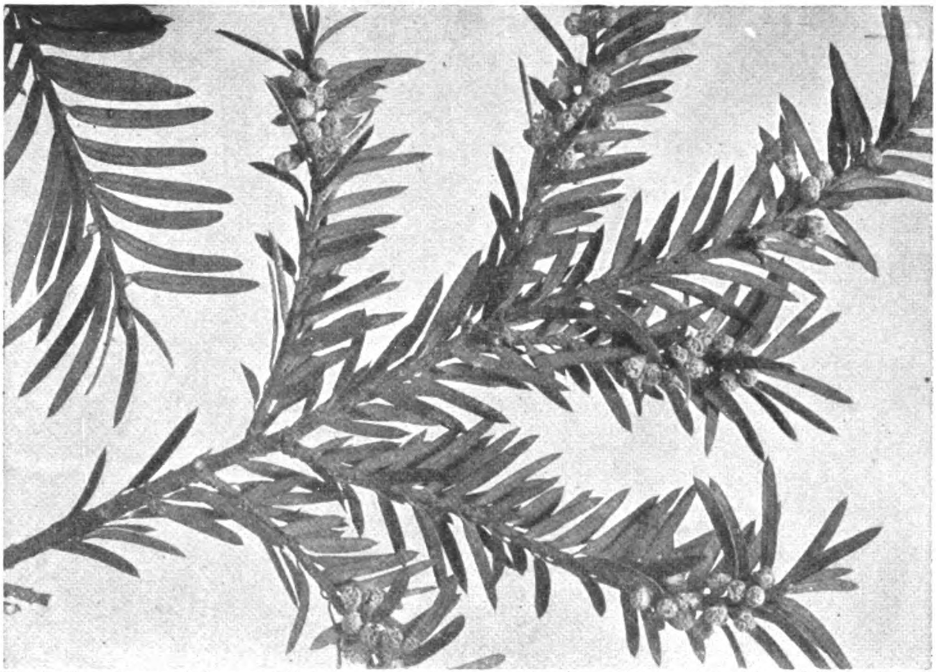


The broad leaves of the plane give the tree its name, for "plane" means "broad." The leaves are like those of the sycamore, but the two trees are not related. The flowers grow in little round balls like old-fashioned buttons.

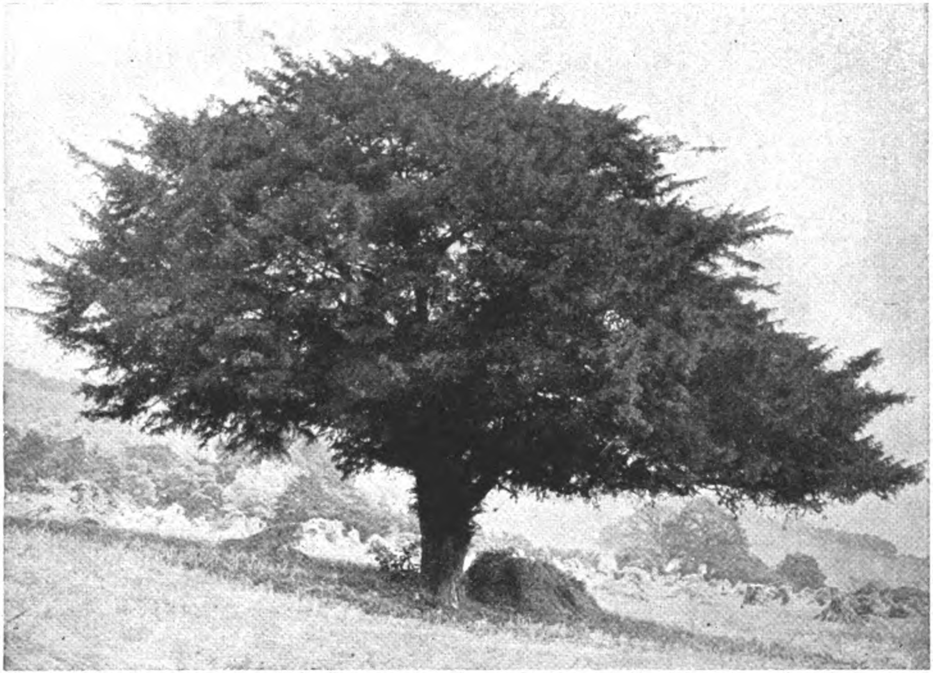


The plane is the most long-suffering of trees, for no amount of smoke and dirt seems to affect it. Even when the bark and leaves are covered with soot, the tree still flourishes, and this is why it is nearly always used for lining English streets. All sorts of other trees have been tried for this purpose, but none flourishes like the plane.

# THE YEW-TREE OF THE CHURCHYARD



The leathery leaves of the yew, which grow very closely together, are poisonous to cattle and human beings, although the berries are not harmful. Often when a yew hedge has been cut, and the leaves thrown aside, cattle have been found dead, having eaten the leaves. This picture shows the leaves and the small male flowers.

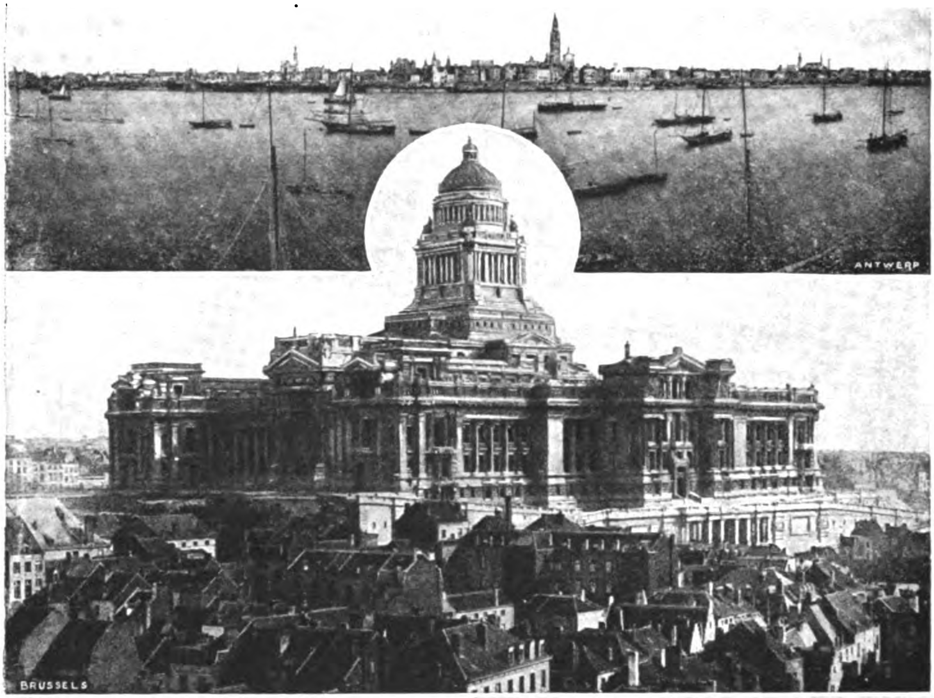


The yew is the longest lived of all the British trees. One at Fortingal, in Perthshire, is nearly 2,000 years old. Before firearms were invented, yews were grown by royal command, because the tough, strong wood was needed for making the long-bows which English archers wielded with such skill. Every churchyard in the country used **to have its yew-trees, and many still remain. "A post of yew will outlast a post of iron" is a common saying.**

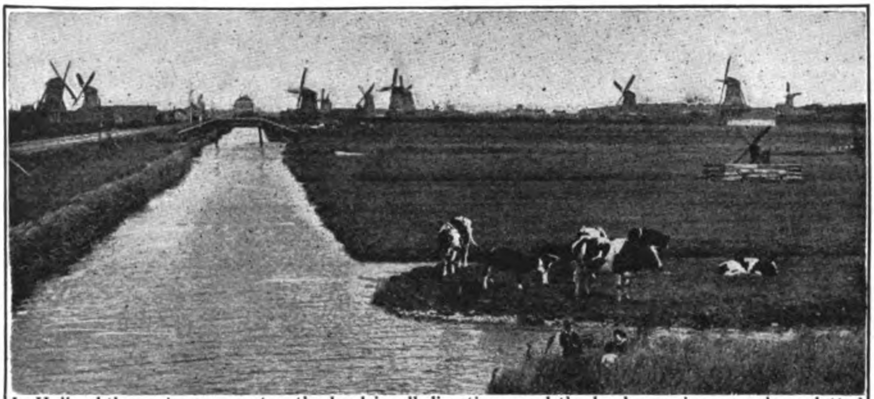
The photographs on these pages are by Henry Irving

THE NEXT PICTURES OF FAMILIAR THINGS BEGIN ON PAGE 3519

# CITIES AND PORTS OF BELGIUM & HOLLAND



There are some very handsome cities in Belgium, of which Brussels, a miniature Paris, and Ostend, the Belgian Brighton, easily take front rank. **The Palais de Justice, or law courts, at Brussels, is one of the finest modern buildings in Europe, as may be seen from the picture of it on this page. Antwerp is one of the half-dozen greatest commercial ports in the world, and has an annual trade of a hundred million pounds. The great commercial ports of Holland, Amsterdam and Rotterdam, too, are among the most important seaports of the continent.**



In Holland the waterways cut up the land in all directions, and the landscape is everywhere dotted with windmills, that are largely used for the purpose of pumping and draining the land.

# HOLLAND AND BELGIUM

CONTINUED FROM 3362

The highest land in Europe, and the lowest, are linked together by the River Rhine. Far away amid the mountains of Switzerland it starts on its long journey, leaping like a merry child, till it passes into the quiet waters of Lake Constance. Then, with growing strength, it dashes and roars, as it tumbles over the rocks at Schaffhausen, and then flows, in staid middle life, rapidly and steadily north, useful and strong and beautiful, for many, many miles through Germany. After passing the grand gate of the Seven Mountains near Cologne, it goes slower, as if age had come upon it, and at last, stretching out weary arms, it seems to be blindly searching for the sea, in which to end its course in peace.

The triangle of low land on the shores of the North Sea between France and Germany—lying in the grasp of these arms of the Rhine and about the lower courses of the Meuse and the Schelde where the great north plain of Europe is narrowest—has been known through history as the Low Countries, or the Netherlands, nether meaning lower. Small as the district is—not so large as Scotland—it has fallen into two distinct countries, occasionally united under one rule through the centuries. Holland, the hollow or marshy land, the northern and larger half, with its ragged coast, lies chiefly in the Rhine delta. Belgium, to the south, has but fifty miles of coast, and consists of the lowlands drained by the Meuse and Schelde, and the highlands of the Ardennes, wooded hills as high as the Berkshires.

It is a very favourite holiday trip now to go to the Ardennes from England. A quick passage of three and a half hours takes us from Dover to Ostend, and from there we can either make a tour round the splendid old cities, speaking vividly of the past, and closely dotted over the fertile and busy plain with its wide swelling rivers, or we can pass on to the beautiful walks and cycle rides, the fine views and interesting caves, the cool woods and bright streams, of the hills beyond on the south-east.

If we prefer a longer sea voyage we can enter Belgium by the estuary of the Schelde to Antwerp, a very great port, connected by rail and canal with not only the rest of Belgium, but with the industrial towns of the Lower Rhine, about a hundred miles away, and easy of access to the places across the ocean which send Europe the raw material that it cannot grow itself. Bruges and Ghent, also deeply interesting old cities, are connected with Antwerp by canals, and Brussels, the capital, is in the centre of the kingdom, so gay, and full of fine shops and handsome buildings, that it is sometimes called a miniature Paris.

It is an easy journey to pass from Brussels to Holland, but if we go direct from England to its shores, we can land either at Flushing, on an island on the north bank of the Schelde, or at the Hook of Holland, on the north side of the Meuse, which leads to Rotterdam, the great port of Holland. The channel of the Meuse is the chief entrance to the Rhine.

### THE DUTCHMAN'S BATTLE WITH THE SEA THAT HAS LASTED A THOUSAND YEARS

Between Flushing and the Hook are the numerous muddy islands formed by the sediments brought down by the great rivers, so here we have some of the earth of Switzerland, Germany, and France. North of Rotterdam are the Hague, the beautiful capital of Holland, Utrecht, Leyden, and Haarlem, so famous in history, and Amsterdam, Holland's largest city of commerce, on an arm of the Zuyder Zee. The Zuyder Zee is the youngest sea in the world, for it was formed only about 600 years ago, when the water burst in over the land, sweeping away villages and farms and the poor folk who lived in them. The greater part of Holland is below the level of the North Sea.

There is an old Dutch proverb: "God made the sea, but we make the shore." For more than a thousand years the making of that shore has been the first duty and thought for those who, living in the land, wished to protect it, and enlarge its borders, against the storms and tides that dash against it.

As we travel through Holland to-day, we are astonished at the engineering skill that has grown through the centuries from perpetual battle with the water.

### A LAND WHERE THE FISH SWIM ABOVE AND THE BIRDS FLY BELOW

Let us stand on one of the great dykes, or sea walls. It is perhaps sixty feet high, and broad enough at the top for a carriage road, bordered with trees and buildings. The sea laps quietly, though it may rage and roar to-morrow, not far below the level of this road, and boats come alongside to little piers and quays; but the other side slopes deep down to the green meadows, so that we on the dyke can see down the chimneys of the houses nestling on them below, and the fish on the one side are higher than the birds on the trees on the other. Very strong, built of stones and cement and willow boughs, are these walls which push back the ocean, and constant care is needed to see that there is no leak, and that the various gates and sluices are in perfect order.

There are strong walls, too, round the lakes and on the banks of the rivers that become flooded when the snow melts in the distant Alps; and everywhere are canals and ditches cut to regulate the flow, and to help the land to keep its head above water. In many places, continuous pumping has to be carried on, and this is largely done by the windmills that are such a feature of the country. From the top of the dyke we can perhaps count twenty or more, for the Dutch make the most of the labour of that riotous giant, the wind, who often does so much mischief in the country.

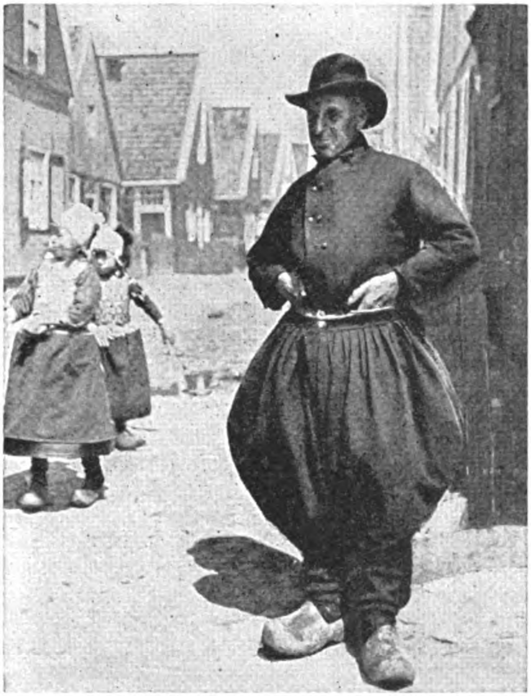
Besides pumping and draining, the windmills saw up wood and grind corn. Many lakes are formed by the draining of the marshes, which has been done with enormous toil and skill; and as we pass from the Hague to Haarlem in the train, we see one of the largest *polders*, as the drained marshes are called, beautifully green and fertile.

### A CITY BUILT ON ISLANDS, WITH CANALS IN THE STREETS AND 300 BRIDGES

If our visit is in the early summer, the reclaimed land will be brilliant with the lovely bulb flowers for which Holland is so famous. In most of the towns, canals run through the streets. Amsterdam, for instance, is built on almost as many islands as Venice, and the canals are crossed by 300 bridges. The soil is so moist that, generally, houses have to be built on a foundation previously made firm by driving in a number of piles. Erasmus, the great Greek scholar, who lived at Rotterdam, and did so much to prepare the Reformation, had this in his mind when he said that he knew a city in which people lived like crows on the tops of trees.

Holland is so flat that there is but one danger-board for cyclists in the whole country. If we mount the towers of any of the fine old cathedral churches we can see all round for miles, right away to the distant horizon. And a bright and wonderful view it is on a sunny day—quite dazzling, for the water shines everywhere, and so do the brass weathercocks and the steel railway lines; and even the sails of the boats on the canals gleam against the green of the fields. It is so strange to see sails mixed up with trees, especially when the rivers or canals are higher than the fields. And over all is the tenderest, delicate light, which Dutch artists know so well how to paint in their pictures.

If our visit to Holland is in the winter, a very different scene meets our eye. Instead of the vivid green, a mantle of white rests over all, and the gleaming waters of the canals and ditches are frozen hard and are covered with skaters—doctors going to their patients, children to school, labourers to their work. The Dutch and the Fen-men are among the best skaters in the world and the Fen counties of England are very like Holland. We have seen many beautiful pictures by great Dutch artists, such as Rembrandt, Rubens, Franz Hals, in the great art galleries, but in the cities of the Netherlands there are ten times as many, illustrating, with the relics in the museums, the life and history of the country, the great scenes which took place through the centuries, the portraits of the leading men who made or marred its happiness, as well as the pictures of home life in palaces and cottages in days long since passed away.



A SNAPSHOT IN A STREET OF HOLLAND

**Although the people of Holland are industrious, no matter where we go, we can see the men standing about, dressed in their big, balloon-like breeches, smoking or talking.**

Let us now, for a while, leave the busy and populous Belgium of to-day, and the Holland so carefully wrested and guarded from the ocean, and glance at the story extending over 2,000 years, of the struggles by which the Netherlands have not only in the end kept their small corner of Europe independent, but which have so strengthened and educated the people that, for centuries, they have been the world's teachers in most of the matters that are worth knowing.

The Low Countries formed but a dull, damp district, shut in by the gloomy depths of boundless forests when we first catch sight of them in the searchlight thrown by Roman civilisation. For countless ages the rivers, which, we see, are very numerous all over the land, had been steadily bringing down slime and mud, and the wind and tide had been occasionally dispersing and destroying the banks thus formed. The early Keltic people who chose these shifting swamps for their home lived like beavers among the tangled brushwood on the islands at the mouth of the Rhine. The bravest of them were the Belgæ, who have left their name in Belgium, and, when the Romans came, several German tribes, of much the same stock as our own forefathers, had pushed out the Kelts. Amongst them the Batavians and the Frisians were celebrated for bravery and love of freedom and their determination to protect the land on which they dwelt. The Batavians proved of great use in the Roman armies.

In the fourth century, the Frankish tribes came swarming over the Rhine, and by degrees they absorbed the Frisians and the Batavians and the rest of the tribes living in the morasses and low plains, till at length all the country fell under the rule of the great Charlemagne. He left the people their native customs, and put chiefs over them as his delegates, whom they had to obey. Part of Charlemagne's plan was to give wealth and power to the bishops of the newly Christianised tribes, and for nearly a thousand years these prince-bishops were very important. After Charlemagne's death the great empire broke up, and under the weak rulers that followed, the independent nobles became ever stronger. There were the Bishops of Utrecht, where was the first Christian Church, the Counts of Holland—Holland being originally a province, which later gave its name to the country.

The Dukes of Brabant and the Earls of Flanders—William of Normandy took his bride from Flanders—were very important nobles as well as the lords of Hainault, which also furnished an English queen, of whom we read elsewhere. Other small states were Guelderland and Friesland. The old laws of the Frisians declare that the race shall be free, as long as the wind blows out of the clouds and the world stands, and this principle has always been kept in view even in times of overwhelming trouble.

### THE RISE TO WEALTH AND POWER OF THE CITIES OF THE NETHERLANDS

These were the bad old feudal days, when the nobles were for ever quarrelling amongst themselves, and, according to their opportunities, doing their best to take away the liberties of the people. The prince-bishops gained more and more power over men's minds, till no one dared to think for himself.

We know how the rise of important towns has always helped on the cause of freedom, and though the towns in the Netherlands are not quite so old as some in France, Italy, and Germany, most of them date from early times. When trade was set moving by the impulse of the Crusades, the towns of the great north and south route began to rise from small beginnings to wealth and power. In the thirteenth to the fifteenth century, the towns of the Netherlands did much business with the towns of the famous Hanseatic League, of which we read on page 2526. In the fourteenth century there were over 3,000 woollen manufactures around Malines, now the centre of the Belgian railway lines; Ghent had 40,000 weavers, and the goldsmiths of Bruges were numerous enough to form a regiment by themselves in time of war. The towns of Delft, Haarlem, Rotterdam, Amsterdam, were all growing, though often devastated by the endless quarrels of landowners and townsmen.

### HOW ENGLAND GREW WOOL FOR THE FLEMISH LOOMS

It was at this time that England grew so much wool for Flemish looms. Linen, too, of various kinds was added to the manufactures. Holland, that stout material we use so much for pinafores and curtains, still bears the name of the country where it has always been largely made.

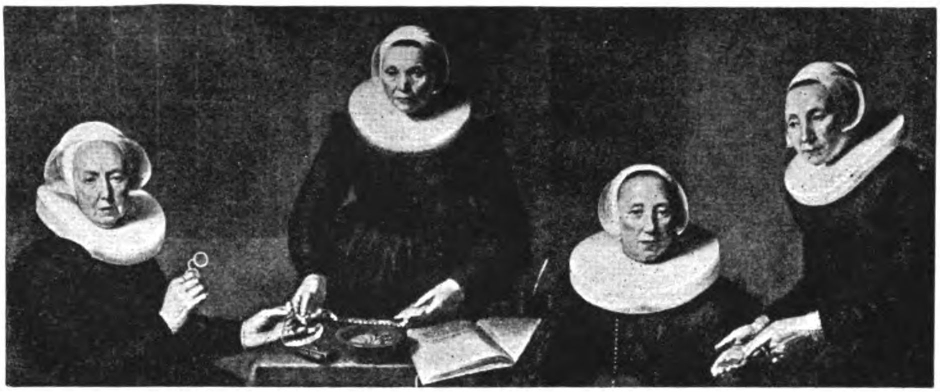
But all the time when the trade and industry were growing, amidst constant scenes of violence and fighting in the streets of the flourishing towns, the struggle against the elements for possession of the country was ever going on. Did the fierce winds heap up the sandhills on the shore, the Netherlanders planted coarse grass to bind it together to make a rampart against further encroachment. Did the river overflow its banks, they were strengthened and heightened, and so by degrees, by patient trial and endeavour, that wonderful skill was attained in building dykes to withstand even the onward rush of the stormy tide, and in making canals and draining lakes. Sometimes, as we have seen, the giant ocean had his way. It was in the thirteenth century that he rushed inland and formed the Zuyder Zee. For years past plans have been maturing to drain this great body of water and restore the land to cultivation.

### THE MAKING OF THE DUTCH RACE AND ITS GREAT FIGHT AGAINST TYRANNY

All this effort for generations produced a wise and determined race, few in numbers, and living in a small country, yet able to resist in the fifteenth and sixteenth centuries the fierce tyranny of the most powerful of the sovereigns of Europe.

For a dark cloud began to grow over the Netherlands when by seizure, purchase, succession, marriage of heiresses, the most considerable of its states passed under the sway of the Dukes of Burgundy. We read on page 2966 how these dukes wished to annex

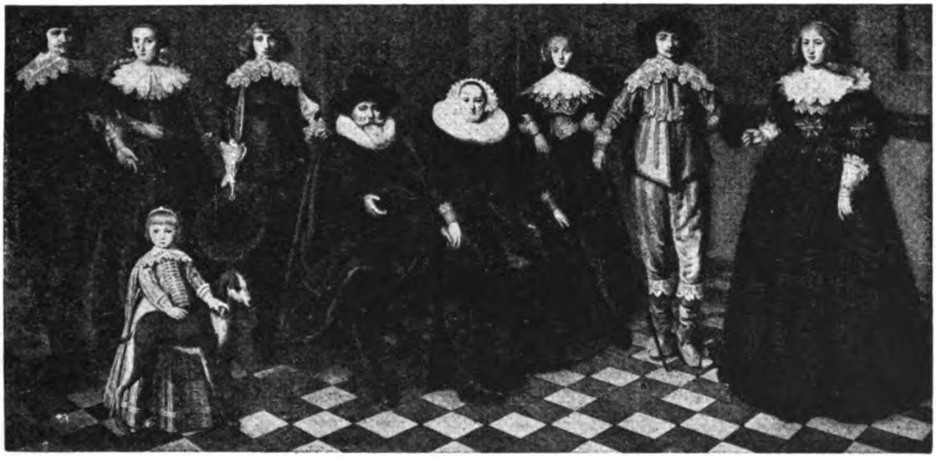
# PEOPLE OF THE NETHERLANDS LONG AGO



**This picture, by one of the old Flemish masters, shows the dress of Dutch ladies in the middle of the 17th century. The four ladies whose portraits we see are the managing committee of the hospital for lepers at Amsterdam.**

Here we see the child life of the Netherlands in the days when the Dutch were at the height of their prosperity.

The houses of the old Flemish merchants were plain, roomy dwellings, each entered through a courtyard.



**This painting of a burgomaster, or mayor, with his wife and family, shows the dress worn by the Dutch people of the better class in the 17th century. We see the costumes of a child and of men and women, old and young.**

Switzerland as well as the Netherlands and make one long independent kingdom between France and Germany. The crafty Louis XI. had very much to say about this, and was at constant warfare with Duke Charles the Bold. From the daughter and sole heiress of this bad as well as bold man were wrested charters of privileges, commonly called the Great Charter—afterwards the foundation of greater liberty by the first regular assembly of the States General, the members of which were sent from the provinces and great cities of the Netherlands.

This young duchess, Mary, married Maximilian of the Hapsburg family, Duke of Austria, and later Holy Roman Emperor. Their son, Philip, succeeded to his mother's dominions, and he married Joanna, the daughter of Ferdinand and Isabella of Spain, elder sister of Catherine of Aragon.

This son was the famous Charles V., who gathered into his hand the rule of the Netherlands with that of Spain and Austria. All these countries hated each other, and the liberties of the Netherlands were in terrible danger from a prince who firmly believed that he had the sole right of disposing of the persons and lives of his subjects, as well as settling their faith and religion.

### THE SPANISH TYRANT WHO PERSECUTED THE PEOPLE OF THE NETHERLANDS

Charles, in spite of his wide empire, was always in want of money, and he required the rich cities of the Netherlands, especially of Ghent, to furnish it whenever he chose to ask for it, and when denied, took away all the charters and rights of those who opposed him, and fined and executed the citizens. Hard as this was, especially when trade from different causes did not bring in so much wealth as formerly, it was not to be compared with the suffering brought upon the country through Charles's tyranny in matters of religion.

We know how the teaching of Luther raised a storm in Germany and in England. That of Calvin, another reformer, powerfully affected France and the Netherlands, and in these countries the rulers hated and feared the Protestants not only because their beliefs went against the supreme power of the Church, but because they denied the absolute power of the rulers themselves; and so as the Netherlanders became more and more convinced that the Reformation was right, and bent all the strength of their determined natures to uphold it, the more bitter became the persecution of those in power, in order to stamp it out. Charles established the terrible Inquisition in the Netherlands, and some of the reformers were burnt under his orders.

### A MAN WITHOUT PITY, WHO SENTENCED A WHOLE NATION TO DEATH

His son, Philip II., carried out his father's plan only too well, and when the unhappy people prepared to rise in revolt against his cruelties and extortions, he sent the Duke of Alva, a most clever soldier, and a man absolutely without pity, to suppress them. Almost the entire population of the Netherlands was sentenced to death without even the form of a trial, and people were suddenly seized and put to death without farther warning, till there was not a family who was not bereft.

A national hero rose up at this time, William the Silent, Prince of Orange. His ancestors had done good service to the House of Burgundy, and William was brought up under the eyes of Charles V. When the worn-out emperor laid down all his crowns to go into a monastery, it was on William's arm that he entered the great hall at Brussels, capital of the Duchy of Brabant, where the brilliant ceremony of renunciation took place.

William very soon ceased to be friends with Philip of Spain, though for years he was called his lieutenant; and after he openly became a Protestant he was the leader of the opposition to the bloodthirsty Alva. The patriots called themselves, at first in grim joke, the Beggars. Sometimes they won, especially at sea, sometimes the Spaniards had the best of it, and the struggle went on for many years under different governors and generals.

### HOW THE MEN OF LEYDEN CUT THE DYKES AND SAVED THEIR CITY

Stories of the heroism shown in this war of independence are told of nearly every town, every acre of the Low Countries. The sieges of Haarlem and of Leyden are amongst the most memorable. Leyden held out a whole year, except for a brief respite, and the

# EVERYDAY LIFE IN HOLLAND TO-DAY

The picturesque life of the Dutch people to-day is well illustrated in this beautiful picture by Mr. G. H. Boughton, R.A., showing a number of Dutch lasses weeding a stone pavement by the side of a wide canal.

The homes of the Dutch are very quaint and clean, and the household crockery is always proudly displayed.

There is no mistaking the national costume of Holland, as seen in the caps and dresses of these little Dutch girls.

Holland's splendid naval history, and the great fight of the people to keep the sea from invading their country, prove that the Dutch are by natural instinct masters of the waves. The Dutch children are, from childhood, perfectly at home in the water, as may be seen from this picture of boys and girls playing in the sea.

The photographs on these pages are by the Photochrome Co., F. Hanfstaengl, and others.

heroic defenders were reduced to awful starvation, but still would not give in. There were fights on the slippery ice in the bitter winter. As a last resource, the dykes were cut, and the water flowed over the hardly won fields, sending the Spaniards away in haste lest they should be drowned; but now the ships that had been waiting almost within sight could come right up to the walls of the town, bearing the precious food to the starving inhabitants.

After a while the provinces of Holland and Zeeland united; and when they felt strong enough they took the important step of renouncing in words the authority of Philip. Elizabeth of England, of whom we read on page 804, helped them cautiously. One of the bravest of the English volunteers who pressed across the North Sea to help the Netherlanders was Sir Philip Sidney, whose story is told on page 467. It was he who, when dying, handed the precious cup of water, untasted, to another wounded man, saying: "Thy necessity is greater than mine."

### HOW THE CHILDREN CRIED IN THE STREETS WHEN WILLIAM THE SILENT WAS KILLED

But scenes of war, of sacking fine cities, of senseless cruelty in persecution, could not last for ever, and after several unsuccessful attempts at union among the provinces, and at making peace with Spain, in 1581, Dutch independence was declared. William the Silent, "Father William," as he was affectionately called, was the head of the new republic. It was nearly seventy years before Spain gave up all claims and titles, and acknowledged the complete independence of the Dutch.

Three years after the Declaration of Independence, the wisest man in Holland was murdered by a ruffian hired by Spain. As long as William the Silent lived he was the guiding star of a brave nation, and when he died the little children cried in the streets.

War still went on under his son, Maurice, and the southern states, with their great towns of Antwerp and Ghent, and many others, were reduced to obedience to Spain for many years after the northern states became free. Protestantism had been stamped out, the brave and clever Flemish workers had been driven away to Holland or to England, to their great and lasting benefit, and the subdued country lay in poverty and exhaustion. Ten years after the rout and ruin of the Armada, started by the fire-ships and the storm off the coast of Flanders, Philip II. died, after a reign of 42 years.

### PHILIP THE SECOND, ONE OF THE GREAT DESTROYERS OF MANKIND

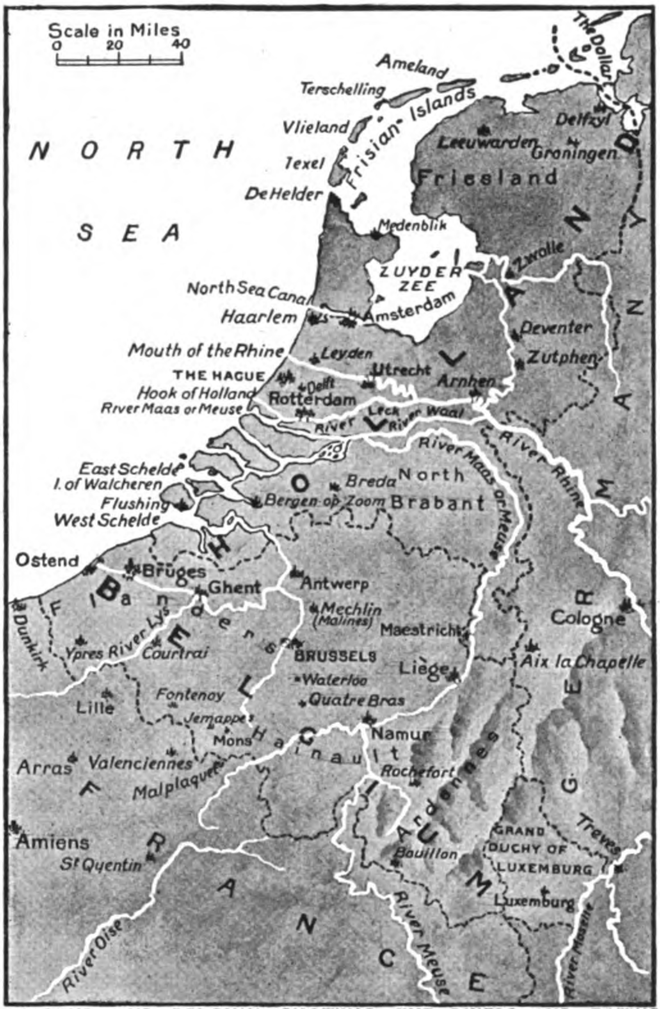
He has been called the destroyer of mankind, for he sacrificed millions of lives to his ambition and superstition. We can think of him sitting at his desk in his palace in the Escurial, planning the affairs of the world—the oceans were to him but Spanish lakes—coolly arranging assassinations and executions; squaring his money matters—his bribes and his losses. And then his long day was done.

It was in 1600 that Queen Elizabeth formed an East India Company to trade abroad, as all commerce had been so hindered by the ambitious plans of Spain. Holland followed suit two years later. Much money was spent on fleets and ports and factories; and from these days the sailors of Holland—trained in the wild fishing-grounds of the North Sea—were to be found all over the world taking possession of the Spanish and Portuguese colonies, and often hotly contesting with the English. New Amsterdam, afterwards New York, was founded across the Atlantic, and to this day both city and people bear witness to the Dutch founders. The city of Batavia was founded in Java, called after the old island province, the kernel of the mother country, and the New Batavia is the headquarters of the Dutch colonial empire to this day. Amsterdam and Rotterdam and all the old cities now revived, as trade flowed in with the arrival of ships laden with "sugar and spice, and all that's nice," at the busy quays.

### HOW THE LAKES AND MARSHES WERE CHANGED INTO RICH MEADOW LANDS

As soon as peace gave leisure, pumping works were established to drain lakes and marshes, and the rich meadow land thus gained fed the finest cattle in Europe. Dutch butter and cheese have long been famous all over the world. Other uses to which the land gained from the sea was put were to grow roots for food and various kinds of hay, besides bulbs of beautiful flowers like tulips. The Dutch taught all Europe how to garden and farm. At this time, too, Holland became the printing-house of Europe, sending out thousands of books of history and travels, law and medicine. Trades, too, such as diamond-cutting—still largely carried on at Amsterdam—gave employment to very large numbers of skilled workmen. It was in the seventeenth century that the rivalry between the Dutch and English on the high seas came to a height. There were many famous admirals, many brave seamen on both sides. Van Tromp and De Ruyter are names as well known to us as Blake and Monk, and for years they tried to sweep each other off the narrow seas. London was in a panic when De Ruyter sailed up the Thames in the inglorious days of Charles II., and sometimes the obstinate sea battles lasted for three or four days, when both sides belonged to a stock that never knows when it is beaten.

In the age of Louis XIV., France made several conquests in the Spanish Netherlands which had passed to Austria, and Holland, too, had its share of French aggression. To save the country, the dykes were opened. Later, the waters froze, and when the French troops were marching over the ice to attack the Hague, a sudden thaw alone saved the country from destruction. The head of the republic at this time was the great-grandson of William the Silent. His name was also William, who married Mary, daughter of James II. of England. When England could no longer bear the tyranny of the Stuarts, William, with his wife, was invited over to be king in James's place. He helped to restore old laws and liberties, and to strengthen the position of the reformed religion. In the eighteenth century the importance of the united provinces of the Dutch Republic became less than it had been in the seventeenth, and there were many disturbances in the country, which led to the interference of the King of Prussia. But the French Revolution was at hand, and before long the map of Europe was completely changed, and bewildering changes came to the Low Countries, both north and south. The seven united provinces were turned into the Batavian Republic, and a few years later Napoleon turned it into a kingdom for his brother Louis. But that did



HOLLAND AND BELGIUM, SHOWING THE RIVERS AND TOWNS not last long. He soon took his brother away, and joined Holland and all the other provinces to France. "They are but the sediments of French rivers," said he, "and therefore clearly belong to me." The decisive battle, about which we read on pages 1095 and 2480, which confirmed the downfall of Napoleon, was fought at Waterloo, not far from Brussels.

### THE BIRTH OF THE MODERN KINGDOM OF BELGIUM

When the Congress at Vienna remade the map of Europe, the whole of the Netherlands was joined into a single kingdom under another William, Prince of Orange. But the northern and southern provinces did not agree about religion—the south being chiefly Roman Catholic—and they differed on many other matters, too; so, in 1830, they revolted, and the old Spanish Netherlands, that were afterwards Austrian, became the Kingdom of Belgium, under a German Prince, Leopold of Coburg.

The northern provinces went on as the Kingdom of the Netherlands, or Holland, under the Prince of Orange. The descendants of Leopold and William are still on the thrones of the two countries.

Belgium has made immense strides in the course of years, and is now one of the most densely populated countries in the world. The great coalfield of the north of France passes into Belgium where the railway lines are so thick, and there are mines of iron and zinc and factories of all kinds, where thousands of people toil hard. Liège, on the Meuse, is a great engineering centre, and in many towns linen is made from flax grown in the neighbourhood, and bleached with the waters of the rivers.

Ghent is the chief textile centre, making both cotton and woollen goods. Great quantities of sugar are made from the beetroots that grow in the fields. Belgium is also famous for fine lace.

### A WONDERFUL PRINTING-HOUSE THAT HAS REMAINED UNCHANGED FOR 300 YEARS

It is a wonderful sight to watch the shipping from all parts of the world at Antwerp, from whose quays and docks the industrious kingdom sends away a great deal of its work, and receives the greater part of its raw material.

Among the surpassing interests of Antwerp is the famous old printing-house, the Musée Plantin, with the types and tools all left in their places, just as they were used in the sixteenth century when the firm of Plantin printed prayer-books for Philip II.

In the cities of both Belgium and Holland the story of the past is perpetually before our eyes. Fine cathedrals and churches, grand town halls and buildings of all kinds, together with the pictures and relics they contain, are like speaking witnesses which link the past with the present.

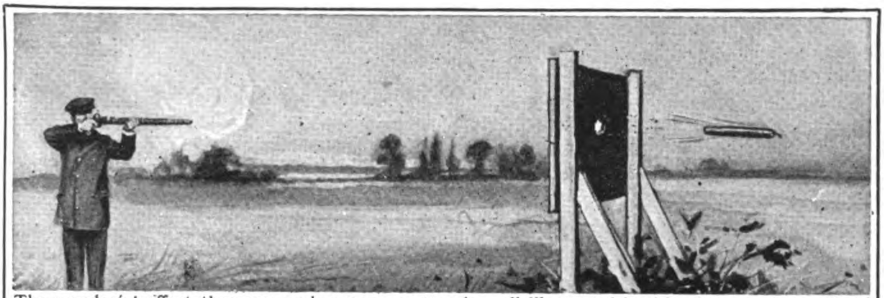
Between Amsterdam and the sea is the famous North Sea canal, which saves ships going round the peninsula of North Holland. It is about fifteen miles long. Both at Amsterdam and Rotterdam the trade is enormous, and deeply interesting are the pictures and collections, especially at the Ryks Museum at Amsterdam. Here are not only models of the ships that swept the seas in the time of Cromwell and Charles II., but some British colours, and a piece of the Royal Charles, captured by the Dutch at Chatham. The portrait of De Ruyter is close by.

### WATER, WATER, EVERYWHERE, BUT NOT A DROP TO DRINK

Let us now mount the Cathedral Tower at Utrecht, and as we look over the wide view, at the dykes, the canals, the windmills, the cultivated fields, the busy towns, we think again of the centuries that have passed since the Batavians settled in the island held in the arms of the Rhine.

Holland is one of the oddest and most amusing countries in the world. Though water is everywhere, there is often not a drop fit to drink, and people have to buy it by the pailful, as they often buy some fuel to boil their kettles. From the high dykes frogs can look down on the birds, and in the damp fields the cows wear coats. Water omnibuses ply for fares on the canals, and coal and peat are brought by brown-sailed boats, which are hitched up to the door, like a horse. The peasants wear beautiful gold ornaments, and costly lace on their heads, and often perch a shabby French bonnet on the top of it. Dogs draw little carts with brass jars full of milk. The brass and copper shine like gold, and everything that can be scrubbed is scrubbed at least once a week, even the big stations.

The next story of Countries is on page 3591.



The wonderful effect that motion has upon matter is well illustrated in this picture. A candle, if pressed againt a wooden board, would be pressed out of shape. But fired from a gun, so that it travels at a great speed, the candle will go right through the wood without itself being injured.

# HOW MOVEMENT CHANGES MATTER

## THE WONDERFUL FORCE OF MOVING THINGS

CONTINUED FROM 3344

We must now go on to another part of the Story of the Earth. We have already a good idea of what the earth is, and we have studied some of the other worlds in space, in order to learn more about the world we live on. We have learnt also about the different kinds of elements that make up the earth and the sun and the stars, and the way in which those elements combine with each other. If we are to use big words, then we can say that we have studied geology, and astronomy, and chemistry, and geography—not the geography that deals with frontiers and cities, but natural, or, as it is called, physical geography; and, lastly, we have studied agriculture.

There still remains to us a very important and very big study, the special name of which is physics, a name derived from the Greek word for Nature. By physics we now mean the study of motion, heat, light, sound, and electricity. Of course, there is no real division between physics and some other sciences, like chemistry, and we cannot understand the one without the other. Nature is not made in water-tight compartments, though I am afraid we often talk and think as if she were, and as if our minds were. It is only for convenience, and because we cannot see everything at once, that we have to study one thing at a time. So here we shall go on to study motion, which is very much more interesting than perhaps it sounds.

When we look at the world around us or at our own bodies, we find that there are two things to catch our eye, matter and motion. In many parts of this book we read about matter—what it is made of, and the way it is put together to form rocks, and planets, and stars. We cannot say anything more about matter itself here, except simply that we do not know much about it. Thirty years ago, men thought they really did know all about matter. Now we know that all we have learnt—and we have learnt a great deal—is only just the beginning. But, at any rate, we know what we are talking of when we use the word " matter," and we can go on to study the thing that is called motion.

Now, motion is not a " thing " in the sense that matter is, and yet it is real. If a boy observes the difference between holding a baseball in his hand and stopping that baseball when it is hit hard in his direction, he will know that motion is real. Or if we notice the difference between our feeling when we jump off a single step into the water and when we dive from a great height, we shall know that motion is real. We are beginning to believe that it is more real than matter, and that matter is really a state of motion of something that we call the ether.

This is so important, and new, and interesting that we must try to understand it. We believe that everywhere throughout the world there is something called the ether. People have laughed at it, and said it was just imagined, but it is probably the most real of all real things except mind. If mind, by means of which we learn about other things, is not real, then nothing is.

### HOW MOVEMENT HELPS TO MAKE LIGHT AND HEAT AND TO MAKE MATTER REAL

Now, when the ether is doing nothing, we are not aware of it; nothing happens, it might not be there. But when the ether begins to move—and it may move in many different ways—then many things begin to happen. That is one good reason for saying that motion is very real. If the ether moves in a particular way, as we shall learn afterwards, there is produced the thing we call light.

Light and radiant heat, the kinds of invisible light about which we shall learn, including the X-rays, and also electricity and magnetism—all these are states of movement in the ether. Now, if we have the least idea of what these things count for in the world, it is quite evident that motion is a very real and important thing. But that is only just the very beginning of what there is to say about it. We are learning that not only the air, but hard matter, such as rock or steel, is also a state of motion in the ether—a different kind of motion from that which produces light and heat, but a state of motion nevertheless.

Heat, we know, means two things, the radiant heat which comes from the sun or a fire, and is a movement of the ether, and the heat of a hot object when we touch it. This last heat, we believe, is due to a to-and-fro movement—a vibration, as it is called—of the atoms and molecules in the hot thing. So this kind of heat also is due to motion.

### A CHAIN THAT SPINS AND BECOMES LIKE A HOOP OF SOLID STEEL

But now let us think a little further of what this means. As a rule, when a thing is made hot it gets bigger. This means that part of the size of the thing is due to its heat—that is to say, to motion. May it not be that the atoms and molecules themselves owe their existence to motion? There are many experiments—and these are being increased every day—that make it probable that this is true. One of the most remarkable of these may be mentioned, and if we have a chance of seeing it done anywhere, we should certainly do so. Can we believe that the hardness, the stiffness, the firmness of a thing can be made simply by the fact that it is moving? If we could suppose this, then we could suppose that the movement of the ether could make it into matter—which we, of course, think of as something hard. Now, if we take a ring of chain, which, of course, simply lies in a heap huddled on the floor, and if we get hold of it in such a way that we can make it spin round at a tremendous rate, it becomes quite stiff, as if it were made of one piece of solid steel, and it will run for a long distance like a stiff hoop until the spinning, or rotation, of it has been exhausted, and then, of course, it will collapse into a little heap of links as at first. The rotation made a thing with no stiffness into a stiff thing.

### HOW A CANDLE CAN BE FIRED THROUGH A WOODEN DOOR

Another wonderful illustration of this is the firing of a candle through a wooden door, the motion imparted to the candle enabling it to make a hole through the wood without itself being injured.

Again, we may take a piece of quite soft tissue-paper, stretch it out and spin it at a great speed. It will cut anything we please, just like a knife. Yet it is only a piece of soft tissue-paper. We have made it hard by making it move. It is possible to show experiments like this, one after another, for an hour on end, every one of them showing that the properties which we think of, when we think of a piece of rock or stone, can be created in things that have no such properties, by making those things move in certain ways.

But by far the most wonderful experiments are those we make with rings of smoke. A smoker can blow from his lips rings of smoke, or we can inject smoke into a square box with a hole in it and an elastic back, and then by hitting the back we can knock rings of smoke out through the hole. These rings are just the same as the smoker makes, but much larger and more easy to observe. Before we can notice what these rings do, or can understand at all what we see, we must learn two things. The first is that the smoke—that is to say, the little specks of stuff that make the ring visible—has nothing to do with the question. We cannot do without the specks, just because they make the ring visible. The real ring, however, is not a smoke ring, but an air ring. Equally good rings are made by hitting the box when we have burnt nothing in it; and we can blow as perfect rings from our mouths when we do not smoke as when we do. Very few people understand this. They think that the smoke is necessary, but the smoke merely shows us the ring.

The second thing to remember is that the ring of air, or gas, has another and distinct motion. It moves through the air, we know, for we can see that. But the point is that the portions of gas that make it up are themselves in movement, and this second movement is something like that which we get if we take an india-rubber ring, and run it along a rod which it fits tightly. The ring keeps on turning itself inside out. Well, a smoke ring, as we call it, moves in this way, and the special name given to it on that account is "vortex ring." The word, like many other English words with v, r, and t in them, means turning and twisting.

### THE MARVEL OF A RING OF SMOKE THAT CANNOT BE DESTROYED

So a smoke ring is really a portion of the air which, unlike the air around it, is in a peculiar state of motion, and we find that this peculiar state of motion gives it the most extraordinary properties. For one thing, it lasts a long time, and retains its independence of the air around it, and it resists attempts to destroy it. We cannot cut it with a knife. If we try to do so, the ring dodges us. One ring may be blown through another, but we cannot make one ring smash another. Now, all this, and much more, entirely depend upon the way in which the air that makes the rings is moving. This motion confers upon the rings the power of resistance. It makes them, like the atoms of matter, very difficult to destroy. It gives them a sort of hardness, just as the spinning of the steel chain gives it hardness. Lord Kelvin, the greatest man who has studied these questions since Newton, supposed that matter may be made up of things like vortex rings. It may be that the ether, by being put into a special state of motion, becomes matter, just as by setting the air into a special state of motion we can turn parts of it into special separate things, like smoke rings.

### THE WONDERFUL RING THAT MAY EXPLAIN THE MYSTERY OF THE UNIVERSE

This vortex-ring theory of matter is the most famous theory of the kind that has ever been suggested, and in all probability it expresses a great part, though doubtless not the whole, of the truth. We shall agree that it justifies what was said at first, that perhaps motion is more important than matter. That must be so if motion makes matter. All over the world, men are now studying the nature of matter from this point of view. The electrical theory of matter which they are now studying is really a sort of version of what we have been saying, and every year we shall hear more about this subject.

Meanwhile, we must learn some other things which teach us how important motion is. When we stop a moving baseball, we know that there is power in it, and that it requires power to stop it. Now, the baseball is the same after it was stopped as it was before, but that power is no longer in it. Its motion was its power. When a train, or a motor-car, or a flying-machine moves, we know the power is coming from somewhere. In every one of these cases, the power is produced by the pressure of a gas, that is somehow or other made in the engine of the machine.

A gas is made in such a way that it wants to expand or stretch itself, and as it does so it drives the engine. This pressure of gases is one of the most important things in the world. Where does it come from? Many men, working together, and after each other, have proved during the last century the truth of a beautiful theory that is called the kinetic theory of gases.

### THE MILLIONS OF MOVING ATOMS OF GAS THAT DRIVE THE MOTOR-CAR

Everyone knows that a kinematograph is a moving picture, though we often spell it with a c, and pronounce it as if it were an s, which only confuses us. The word comes from the Greek word for motion, and so the kinetic theory of gases simply means the theory that the pressure and the other properties of gases are due to the movement of the little atoms and molecules that make up the gas. This is now proved to be true. It is the little motions of unthinkable millions of molecules that make the big motion which we see of the train or the motor-car. It is the adding together of these tiny little motions that makes great masses of rock fly into the air when we cause an explosion, or that sinks a battleship when a torpedo, or submarine mine, explodes. Never was there such a good illustration of the proverb that "mony a mickle maks a muckle." Motion is power, and the big motions that we see, and all their power, are due to the little motions we cannot see. There is another most extraordinary thing which very few people have thought of, but which should make us interested in motion if nothing else does.

### THE ONE AND ONLY THING THAT HUMAN BEINGS CAN EVER DO

Here are we human beings, who could not live for a minute without the motion of the blood in our bodies; and we are become the lords of the earth; we have changed its surface so much that men upon the moon could see the difference we have made. We rule other living creatures; have built great cities and ships; have learnt many of the secrets of the stars. And yet when we look upon ourselves and ask what it is that we can do, what it is by means of which mankind has done and will do everything, the answer is simply that we can move things. That seems absurd at first, but it is absolutely true. There is nothing that any human being has ever done, or ever can do, that does not depend upon his power to move things. All he can really do is to move his own body, in part or as a whole, and so, by pushing against other things outside him, he can scoop a hole in the earth and live in it, or put together machines that will build a palace.

We move our chest, and lips, and tongues, and so we speak, or we move our bodies to get hold of something that will make a mark; we move our fingers round that something, and then move it on something else, and so we write. We have done wonders, and we shall do much greater wonders yet; but all we can do is to *move things.* The lesson to be learnt from this is how great the result of the mere movement of things may be. Indeed, just as all the doings of Nature depend upon movement, so do all the doings of man.

### HOW WE ARE ABLE TO KNOW WHEN THINGS ARE MOVING

We have only to think of the apparent motion of the sky as the earth turns, or of the way in which we may be puzzled to know whether our train, or the train on the other line, is moving, to understand that we only know the movement of a thing by comparing it with something else. The only motion we can understand is relative motion. If there were just one point in the universe that could think, and there were nothing else in all space, that point could, of course, move about. But no one can imagine any means by which it could know that it was moving at all, much less the rate or direction of its motion. All we know, then, is motion as compared with something that is not moving, or that is not moving in the same way. Thus the whole universe of stars may be moving, but whether it is doing so, and, if so, in what direction and at what speed, no one can say, because there is nothing against which to test this motion. If the ground runs along under a runner as fast as he runs, how shall we measure his running? And this applies alike to trains, and stars, and everything else.

A solitary thinking *point* and not a thinking *person* has been suggested, and the reason for that was that there are two kinds of motion which a person might undergo, just as there are two kinds of motion which we see in a smoke ring. The smoke ring can move as a whole, and its parts can twist and turn among themselves.

### HOW OUR BODIES ARE WHIRLED ALONG WHILE WE SIT QUIETLY IN A CHAIR

So we also can move about from place to place, or we can double ourselves up without moving away from where we were. If one of us were utterly alone in space, he could learn what motion was by moving his body about, but he would know no more of the motion of his body, as a whole, than we do when we sit quietly in a chair, not knowing that in every second of time our bodies are moving many miles with the earth. Motion from place to place is often called *loco*-motion, which just means place-motion; and we call a machine for producing such motion a *loco*-motive. But the proper name for this kind of motion is ***translation***, and we compare that with ***rotation***. Translation literally means carrying across; rotation, we know, means spinning, and a thing may be undergoing either of these kinds of motion, or both. When a baseball is batted, the batter usually so arranges that it has both a movement of translation, which we can all see, and a movement of rotation, which we see the results of when a ball touches the ground or swerves in the air. As the earth flies through space it has both movements, the translation making the seasons, and the rotation making day and night. When translation of any body occurs, rotation is quite difficult to avoid. Drop a book or a ball from a window, and we find it very difficult to prevent it from twisting as it falls.

### THE SLOW SHIVER OF THE EARTH UPON ITS AXIS

Along with these two kinds of movement, there is a third, which is a movement of vibration, or trembling. This to-and-fro movement, which we can feel in ourselves when we shiver, is not the same as rotation. It is really a movement of translation, but as it is constantly reversed, the moving thing does not change its place altogether. A wave is an instance of a movement of vibration, and we must clearly understand what many people find difficult, that the point is not the rate of the vibration. The to-and-fro movement may be millions of times a second, or it may be only once a second, or even slower still. The to-and-fro swing of the pendulum is a true vibration, and would be a true vibration if it were a million times quicker or a million times slower. The axis of the earth seems to undergo a great vibration, or to-and-fro movement, which is quite distinct from its movement of translation and its movement of rotation, and the period of this vibration—to use the proper term—is not one second, as it may be with a pendulum, nor yet less than a billionth of a second, as it may be with a wave of light, but about twenty-five thousand years. Yet it is a vibration. These three words, translation, rotation, and vibration, we should always remember when we think about motion. When we study the universe as a whole, and find things in motion about us, the first question we are bound to ask is: Where does this power come from? The only answer to this question is that it comes from the great Cause and Author of all things. He is the first and ultimate cause of all motion.

### THE GREAT LAW THAT MOTION AND POWER ARE NEVER LOST

If now we ask what are the nearer causes, we make one great discovery, which is the greatest discovery ever made by science, and which is often referred to in this book, and in every other book that deals with science at all. This discovery is that motion, like power in all its other forms, is never made out of nothing, and never lost. This was guessed by the first of the Greek thinkers, Thales, some 2,500 years ago, and it was proved once for all in the nineteenth century.

Wherever we find motion, there we know there must have been either some other motion, of which this that we see is the continuance, or else some power has been spent somewhere to produce it. When a ball leaves the arm, the motion of the ball and the power of it have been derived from the power in the sugar of our muscles when the ball was thrown. And so in every case. This great principle, which is true not only of motion, but of everything else, has a special name, which is rather long, but is not really difficult. It is called the ***conservation of energy***. Energy is just a special word for power, and the law of conservation states that power is neve: lost; it is also part of the law, though the name does not say so, that power is never made out of nothing,

One of the ways in which this shows itself is in what is known as Newton's first law of motion. Everyone should know this, for it applies to everything. It is often called the law of inertia, which simply means "doing nothing."

### WHY MOVING THINGS DO NOT GO ON MOVING FOR EVER

This law says that when a thing is moving, it does nothing itself to change its motion. It therefore will go on moving for ever, and in exactly the same direction, and at exactly the same speed, unless and until some other power stops it, or turns it, or makes it go slower or faster. That is half of the law of inertia, but only half of it; and it is given first because it is the half that people usually forget when they talk about inertia. The half that most people know is really the same thing, but looks different. It is that when anything is at rest, it remains at rest, doing nothing, until something moves it. Whenever we think of inertia, or Newton's first law of motion, we should remember both halves of it, or, rather, the two ways in which it works out.

### WHY A BALL FALLS WHEN IT IS THROWN INTO THE AIR

Everyone understands how it applies to a thing that is not moving, but very few people remember how it applies in the other direction. They do not know that a thing which is moving will not stop unless something stops it. We see a ball thrown up into the air, or thrown over the surface of the earth, and we know that the motion ceases. This is our experience with practically all motions, and so we get the idea that when a thing moves it gets tired, after a time, and stops. It was one of the most tremendous discoveries ever made that this is not so, and that the smallest touch applied to the biggest thing, sufficient to move it at all, will keep it moving at that speed and in that direction for ever, without its ever getting tired. When the ball thrown up is stopped, the earth by its pull stops it, and the resistance of the air helps also in the stopping of the ball.

When a ball running along the ground stops, it does so, not because it has a tendency to stop, but because the resistance of the air and the friction of the ground stop it. The real tendency is for the thing that is at rest to remain at rest, and for the thing that is moving to go on moving. If we think of the matter, we shall see that if things did not behave in this way, the law of the conservation of energy would not be true.

### THE GREAT LAW OF NEWTON THAT EXPLAINS WHY THINGS STAND STILL

If things could be started moving without anything moving them, then power, or motion, would be made out of nothing; if moving things could be stopped without something stopping them, then motion, as we can easily see, would be made into nothing. That is what we mean when we say that Newton's law is really a special illustration of the great law of conservation. Newton discovered two more laws of motion, thus making three, which will always be known by his name. The second law is quite simple. It says that when anything is made to move, its motion is in strict proportion with the force that makes it. Further, the thing moves in the direction of the straight line in which the force acts. This is true, no matter if there be twenty different forces acting in different directions upon a body, and it is true whether that body be at rest or already in motion.

Using this law, it is possible for us to find out exactly in what direction, and at what rate, a body will move if we know the power and the direction of any number of forces that may be acting upon it. We discover also the profound truth that rest is a state of balance of forces; forces are pulling, but other forces are pushing. These exactly oppose each other, and so the result is rest. Gravitation is pulling this book as it lies on the table, but the strength of the table resists the force of gravitation, and as it acts in exactly the opposite direction to that force, the book remains at rest.

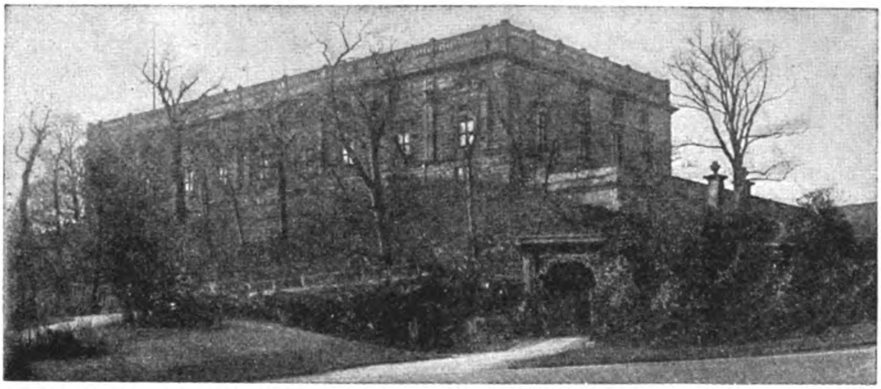
### HOW A GUN HELPS US TO UNDERSTAND THE LAWS OF MOTION

Newton's third law of motion is that "action and reaction are equal and opposite." This great law, which is really, when we come to examine it carefully, another version of the law of the conservation of energy, is very well illustrated in the kick, or recoil, of a gun when it is fired. The amount and force of the rifle as it kicks back are exactly equal and exactly opposite to the amount and force of the bullet as it goes forward.

We shall next have to name briefly three other laws of motion which we know by the name of Kepler's laws. We must not confuse them with Newton's laws, but they are in some ways just as important, because they lead up, as we shall see, to Newton's greatest discovery, the law of gravitation.

All these laws are of supreme importance, and though we may not be able to understand all their details, we should certainly know something about them, for the existence of the universe, including this world on which we live, depends upon them.

The next part of this is on page 3547.



# THE HEROINE OF NOTTINGHAM CASTLE

CONTINUED FROM 3352

One of the brightest stories from the Civil War in England is the defence of Nottingham Castle by Colonel and Mrs. Lucy Hutchinson. The building in the picture stands on the site of this famous old Norman castle. The king set up his standard on August 22, 1642, at Nottingham, near which the Hutchinsons lived. The whole country was in a ferment, and Ireton, their neighbour and relative, urged them to support the parliamentarians, which they did. Mr. Hutchinson received a commission as lieutenant-colonel, and the family removed to Nottingham for greater security. Soon, as Governor of Nottingham Castle, Colonel Hutchinson had to defend it.

For four years Mrs. Hutchinson was shut up in the castle, acting as surgeon during the siege, tending the sick, supplying food for the big household, medicine also, where it was needed, and ever cheerful and wise in her counsel.

She shared all her husband's plans, approved his stern refusal of the many attempts to bribe him into submission, and showed in the notes she wrote down at the time that she must have witnessed scenes and undergone anxiety enough to quell the stoutest heart. There were her little children, too, who needed her constant care. Newark, a neighbouring town, was on the royalist side, and many of the citizens of Nottingham were also royalists. One of them during the night secretly let the Governor of Newark and six hundred soldiers into the town. Next morning the colonel found himself besieged in his little fortress with eighty men. Enemies were all around, but messengers got through and sent for succour to the garrisons at Derby and Leicester.

On the third day Colonel Hutchinson was invited to parley with the royalists in St. Nicholas' Church. His answer was to hoist a red flag on the tower of the castle and to fire his cannon at the church steeple. Two more days passed, and then, to their relief, the watchers on the tower saw a party of horsemen galloping to their assistance. As these men drew near, the royalists retreated, but not without a sally from the besieged, so that they retired in confusion.

When the war was over, Mrs. Hutchinson acted as peacemaker between a band of soldiers preparing to attack the town and the citizens arming for its defence, and later, when the Stuarts came back to power after Cromwell's death, she worked to secure her husband's pardon. It was denied, and the brave wife cheered and comforted her husband in prison in the Tower, and afterwards in Sandown Castle, until his death.

# THE BOY ON THE BURNING DECK

FROM Corsica came a youth, the boy who "stood on the burning deck," whose fame is known to all through Mrs. Hemans' poem, given elsewhere in this book. The Corsicans say that he was Giacomo Jocante Casabianca, a middy who went in the Orient, the flag-ship commanded by his father, with the French fleet that Napoleon took to invade Egypt.

On the evening of August 1, 1798, Nelson sailed up to attack the French vessels as they lay in Aboukir Bay; and some of his ships, getting between the French and the shore, fired on the French from both sides at once.

The English guns were pointed for hours at the Orient, the finest ship of the fleet. Broadside after broadside was fired at her, yet still the French flag waved, until from Nelson's Vanguard a deadly fire wounded the captain, and set fire to the vessel. Inch by inch the flames drove back the sailors, and, one by one, they reluctantly abandoned their guns. Then Casabianca's father, mortally wounded, yet still at his post on the quarter-deck, gave his last order to the faithful defenders of his vessel to abandon her.

Begging him to come with them, they sprang into the water, where many were saved by the English. It was now between nine and ten in the evening, and the flames crept on, while the boy urged his father to jump into the sea with him. The father refused to desert his ship, but prayed his boy to leave him. The son leave his father! No. That was impossible for a Casabianca. He would die with him.

And so the two stood calmly, hand in hand, while the flames shot up from the portholes, and the deck caught fire beneath them. At last the end came; and, with a thunderous explosion, the burning vessel sank for ever beneath the blue waters of the Mediterranean.

# THE DEVOTION OF A KING'S DAUGHTER

KING LOUIS XII. of France had a daughter Renée, who became Duchess of Ferrara, in Italy, and a Protestant. She was a gracious helper of all who were in distress. It is said that she aided more than ten thousand destitute French soldiers passing through Ferrara from the wars in Italy, and her castle of Montargis became the refuge of the persecuted Huguenots.

One of these, the Prince of Condé, had been imprisoned by the Duke of Guise; but he had a devoted and clever wife who, while visiting him in prison, managed to change clothes with him, so that she remained in his place while he escaped to Montargis.

This change was soon found out, but the Duke of Guise was foiled in all his attempts to trace the escaped prisoner. Then he bethought him that, if the princess were released, she would follow her husband, so he gave orders to set her free. His guess proved correct; she was followed to Montargis.

The Duke of Guise, who had great power in the land, ordered the duchess to give up the prince, but she refused to do so. Even when the king, Francis II., demanded the same thing, and sent troops, she still refused. The prince in his little room overheard the brave refusal to surrender him, but he overheard, too, the timorous fears expressed by a few of the guards, and, turning to these, he cried that since they had not courage to defend him, his death should remove their fears. He hastened on to the ramparts with the intention of exposing himself.

Below him, at the foot of the castle walls, he saw the officer of the artillery, and shouted to him that he was the man they sought, and that on him alone should vengeance be taken, so that he might die, as he had lived, with honour. Much astonished, the officer sent for his leader, who told him that he must certainly fire on the prince.

But the faithful duchess stood by the prince's side, and, seeing the cannon directed against her friend, threw herself in front of him, exclaiming:

"Fire on me, and kill at the same instant the illustrious Condé and the daughter of the king you mourn!"

The soldiers, who adored the memory of Louis XII., implored with one voice that his daughter should be spared, and, refusing to attack the castle, marched off to their tents. The prince and his friends escaped into safety that night.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3553

## THE NOVELS OF THACKERAY

**THE first great success among the stories of Thackeray was that of "Pendennis." It began to appear in instalments in November, 1848, and had been preceded by "Vanity Fair," which at first did not attract great attention, but had made the reputation of its author before it was finished. "Pendennis," on the other hand, was a success from the beginning. It is a very long story, describing the life of an imaginary young man, who is very far from being a hero, as his faults are quite as pronounced as his good qualities, and sometimes far more evident. The genius of the author is seen in the fact that, although he never endeavours seriously to win our affections on behalf of Arthur Pendennis, he maintains our interest continuously in his character, which is the most difficult task of a novelist.**

# THE HISTORY OF PENDENNIS

CONTINUED FROM 3368

THE Arthur Pendennis with whom our story opens is not he whose history it attempts to tell. Major Arthur Pendennis was an elderly bachelor, who, having served his time in the king's army, and retired on his pension, contrived with much ingenuity to cut some figure among the dandies of his day, although his means were of the scantiest. He just missed falling into the ranks of those who are known as the "shabby-genteel," and being a perfect worshipper of rank and title, he was ever to be found where anything was to be gained from association with people more wealthy and distinguished than himself. That is to say, he lived a good deal on the credit which his familiarity with the noblemen of the day earned for him in the minds of those who were not themselves favoured with the friendship of those great ones.

To be quite frank about the old dandy, he was a good deal of a humbug. He even pretended in his manner of dress to be a great many years younger than he really was; but, despite his little whims and pretences, most people liked the major, and few members of his club were more in request than he at dinner-parties.

Major Pendennis was seated one morning in his club, with a little heap of letters before him, most of which were from lords and ladies inviting him to honour them with his presence at their different parties; and he was making mental notes as to how he could fit in the various engagements, which to accept, and which to decline, when all his plans were upset on opening the last letter of the heap. This was written by his nephew and namesake, Arthur Pendennis, and the reading of it sent the major purple with indignation. It is with this Arthur Pendennis that our story is concerned, and later on we shall discover why his letter made the major so ill-tempered.

A good many years before the day on which Arthur's letter was read by his uncle at his club in Pall Mall, Mr. John Pendennis, the brother of the major, and father of Arthur, had carried on business as an apothecary and surgeon in a very unpretentious little shop in the city of Bath. John Pendennis was a quiet, old-fashioned, economical man, and by dint of careful saving he was able at last to fulfil the dream of his life. Selling his business, he bought a little estate near the small town of Clavering, in the west of England, and settled down there for the remainder of his days as a real country gentleman.

This little estate was on the fringe of the greater one of Clavering Park, and, naming it Fairoaks, Mr. Pendennis felt that he could hold up his head with any of the landed proprietors in the district. He assumed all the airs of a gentleman of long lineage, boasting a pedigree that went back to the time of the Norman Conquest. His young wife, who had been a Miss Helen Thistlewood, he had also chosen because she was a very distant, although very poor, relative of the noble house of Bareacres.

Thus the quaint little snob began quite late in life his new career as John Pendennis, Esquire, of Fairoaks, Gentleman, his humble days when he dealt in drugs and porous plasters quite forgotten. Portraits of great Pendennises of the past, such as Roger, who fought at Agincourt, and Arthur, who carried himself so well at Cressy, and many another Pendennis hero hitherto unknown to fame, came from none knew where to adorn the walls of Fairoaks mansion.

### ARTHUR'S FATHER BECOMES A GENTLEMAN AND INVENTS HIS ANCESTORS

You will see that, like his brother the major, John Pendennis was also something of a humbug. The major had but little interest in him while he had been a mere apothecary ; but as the Squire of Fairoaks, he was proud of his brother, and delighted to see little Arthur growing up in the firm belief that he was the son of a long line of gentlemen.

Mrs. Pendennis herself was a gentle-natured woman, who had a profound admiration for her elderly husband, and doted upon her boy Arthur. The result was that when Mr. John Pendennis died, and Arthur had reached the age of sixteen, that young gentleman had been spoiled on all hands, and too suddenly became conscious of his own greatness as the new Squire of Fairoaks. His uncle would have had him go back to Greyfriars School and continue his education, but Arthur coaxed his mother to let him remain at home, the lord of his estate.

### SOMETHING ABOUT A YOUNG LADY OF IMPORTANCE IN THE STORY OF PENDENNIS

This was the beginning of his many follies, for his home studies were confined to some daily readings in the poets with Mr. Smirke, the curate from Clavering, and the writing of passionate verses imitating the style of Byron, which were published in a local paper. For the rest, he fancied himself a very gay young man, interested in sport, and inclined to regard his mother and his adopted sister, Laura Bell, as very slow-going and old-fashioned, although he had a sincere love for them both.

As Laura plays an important part in the story, we should know something about her here. Long before Miss Helen Thistlewood had imagined she would marry an elderly little gentleman with a bald head, there was a poor young graduate of Cambridge University with whom she was in love. But the Rev. Frank Bell had so long to wait for a church that he and Helen drifted apart, and in the end he went abroad and married there.

It was after Helen had become Mrs. Pendennis that both Mr. Bell and his wife died, and their daughter Laura, who inherited a tiny fortune, was adopted by Mrs. Pendennis. She had proved herself worthy of Helen's love and care, and was now growing into a beautiful and adorable young woman. Laura's admiration for Pen, as her adopted brother was familiarly called, was so frank and whole-hearted that Helen nursed fond dreams of a great happiness she hoped to experience some day, when Laura might consent to please her by doing a certain thing. And in due time we shall discover whether Laura made her happy.

### ARTHUR FANCIES HE IS IN LOVE AND BEHAVES VERY FOOLISHLY

We must now return to the doings of Pen, for that handsome young man was certainly as active as he was foolish ; and his history, when fully told, is indeed a long one.

It happened one day that, when Pendennis was in the county town of Chatteris, whither he had ridden over to deliver a new poem to the editor of the local paper, he fell in with a very over-dressed and horsy young fellow named Foker, whom he had known at school. Harry Foker was no suitable companion for him, being densely stupid, and interested only in low sports, for which he was well supplied with money, his father being a rich brewer who had married Lady Agnes, sister of the penniless Earl of Rosherwood, to one of whose daughters Harry was engaged to be married. He was a kind-hearted young fool, this brewer's son, and found many people to help him in the spending of his money. Pendennis was greatly impressed by the expensive dinner to which he invited him, and gladly accepted his invitation to accompany him to the theatre, where an actress, whose stage name was Fotheringay, was performing. The play was a great experience for Pen. The actress seemed to him a

# HOW PENDENNIS'S DEBTS WERE PAID

"You know, mamma," said Laura, "that I have been living with you for ten years, and you have never taken any of my money. Now, if I had gone to school it must have cost me at least fifty pounds a year, so that I owe you fifty times ten pounds, which doesn't belong to me a bit. So we will go to the lawyer and ask him for the five hundred pounds, and I dare say he will lend you two more, which we will save and pay back; and we will send the money to Pen, who can pay all his debts without hurting anybody, and then we will live happily ever after."

veritable queen of tragedy, and he was back in Chatteris next day to enjoy at the hand of Foker the great privilege of being introduced to the father of the actress.

This person, who was known as Captain Costigan, was an Irishman, much given to drinking and boasting of his tremendous exploits in the "Foighting Hundredth and Third," although he had clearly fallen on evil days, as his clothes were shabby and dirty, and his face, once handsome, had not been improved by his fondness for the bottle.

But, fluttered as Pen had been at the thought of meeting the captain, his delight was unbounded when that frowsy person invited him to meet his daughter, "the peerless Fotheringay." Although she was a beautiful woman, and later on became famous as an actress in London, she was uneducated and stupid; but poor bewitched Pendennis thought her a very queen, worthy of his homage.

"How beautiful she is! How simple and how tender! How well she talked! Emily! Emily!" So he said aloud to himself in rapture as he rode home to Fairoaks that night. Day after day he was a constant visitor to Chatteris to watch her as she acted on the stage, and to take to her the poems he wrote about her beauty and her dramatic power.

While the rascally Captain Costigan encouraged Pen in every way, his daughter received the admiration of the youth, who was several years younger than herself, in a very matter-of-fact and unromantic way. But, to the dismay of all his friends, Pen announced his intention to ask the tragedy queen to become his wife, and had almost induced his mother to give her consent, when Dr. Portman, the vicar, suggested sending for his uncle, the major.

Pen himself determined to write to his uncle, informing him of his mad intention to marry the actress, with whom he foolishly imagined himself to be in love. It was a frank and manly letter that he wrote; but, none the less, as we already know, when old Major Pendennis opened and read it at his club, it threw him into a violent temper, and speedily brought him to Fairoaks.

### HOW MAJOR PENDENNIS PRESERVED THE "HONOUR OF HIS FAMILY"

The old campaigner did such good service in the sacred cause of his family by talking with so much reason to Captain Costigan and rendering that needy person a little service, that the captain had no difficulty in persuading his daughter to write a brief note to Pendennis releasing him from his promise to marry her; and although the foolish youth talked wildly of dying, he did nothing of the sort.

Pen wrote many more verses full of sadness and sorrow, and after a time decided that he would go to Oxbridge University in order to study for some career, the exact nature of which was not quite clear to him. Harry Foker and other old school-fellows from Greyfriars were there already, reading for their degrees, though there was not the slightest hope of the brewer's son ever passing. So Mrs. Pendennis had to scrape together all her savings in order that Pen might go away well provided.

Once there he conducted himself more like the son of a rich nobleman than a small country squire. In personal appearance and in mental gifts he was probably better fitted to be a nobleman's son than many who were such in reality, and he speedily became the most popular of all the students. Yet he never did what was expected of him.

### PENDENNIS LIVES LIKE A LORD AT THE UNIVERSITY AND GETS INTO DEBT

All the prizes, which, it was thought, he had only to try for in order to win, were carried off by others, and the brilliant Pen contrived to do nothing more original than run deeply into debt. Every penny his mother could find for him was spent, and at the end of two years, when he had failed in his examinations and found himself seven hundred pounds in debt, he fled from Oxbridge to London, where his uncle, who had been mightily pleased to hear of Pen's lordly acquaintances at the university, gave him the cold shoulder on learning of the scrape he had got into.

Thus turned away by the major, who was ready enough to help when the "honour of his family" was at stake, but, desperately poor himself, could take no interest in his nephew's money troubles, poor Pen behaved as many another prodigal son had done before, and, writing to his mother, announced that he was coming home to throw himself upon her kindness, which he had so grossly abused. Mrs. Pendennis, gentle soul, was full of forgiveness for her boy, and there was another who shared with her the determination to help the foolish young man out of his scrape.

"You know, mamma," said Laura, "that I have been living with you for ten years, during which time you have never taken any of my money, and have been treating me just as if I was a charity girl. This obligation has offended me very much, because I am proud, and do not like to be beholden to people.

### HOW ARTHUR'S ADOPTED SISTER THOUGHT OF A WAY TO PAY HIS DEBTS

"Now, if I had gone to school—only I wouldn't—it must have cost me at least fifty pounds a year, it is therefore clear that I owe you fifty times ten pounds, which doesn't belong to me a bit. Now, to-morrow we will go to Chatteris, and see that nice old Mr. Rowdy, with the bald head, and ask him for it—not for his head, but for the five hundred pounds, and I dare say he will lend you two more, which we will save and pay back; and we will send the money to Pen, who can pay all his debts without hurting anybody, and then we will live happily ever after."

Thanks to this little plan of Laura's, Pen's debts were paid, and although he had to observe many little economies in his life at Fairoaks, and had to see his devoted mother and Laura stint themselves for his sake, he could think of nothing better to do than the writing of gloomy poetry. It was due to Laura that at length he determined to return to the university, where, behaving very differently, and applying himself to his studies, he took his degree without difficulty, and again came back to his aimless and despondent life of idleness at Fairoaks.

An event of some importance in the history of Arthur Pendennis now happened. Clavering Park, the great mansion of the countryside, was to be reopened, and after many years a Clavering was to be in residence there again. Sir Francis Clavering was a person of very doubtful reputation, and had at one time been an inmate of the debtors' prison, before he went abroad to make a living by means best known to himself. Luckily for him he had married in Calcutta the daughter of a wealthy indigo planter, named Snell, and came into possession with her of a large fortune. She was understood to be the widow of a ship's officer named Amory, who had mysteriously disappeared, and she had one daughter, Blanche. The fact that the Snell fortune had been made in doubtful ways did not trouble Sir Francis Clavering. He was very glad to find in Mrs. Amory a wife who was as good-natured as she was vulgar, and whose great wealth was at his service.

### PENDENNIS'S LIFE AT FAIROAKS AFTER HIS RETURN FROM THE UNIVERSITY

It was great news for the district that Clavering Park was once more to awaken into a life of gaiety and activity, and Pendennis was not the least of those interested in the prospect of some new excitement in the dull and purposeless life he was living. His little estate adjoining the great one, meant that Fairoaks would, to some extent, share in the revival of Clavering Park.

Nor was he at first insensible to the charms of Miss Blanche Amory, the daughter of Lady Clavering. This young lady, very fair and pleasant to look upon, had a romantic turn of mind, which led her to poetry of much the same character as Pen had affected. Sadness was the keynote of their thoughts, although neither had any reason for sadness, except the wish to appear romantic, after the style of Lord Byron.

Pen took to fishing in the river, and Blanche also discovered some new interest in walking there. They exchanged their sad and sorrowful verses, and there was a certain hollow tree that made a most romantic post-office, where they could leave letters for each other. But when, in the course of time, the great families of the county, who at first had stood aloof from the Claverings, began to show friendliness to Sir Francis and his family, thanks to the wealth of the widow Amory, Miss Blanche curiously lost her taste for these romantic little walks and the delights of the hollow tree post-office.

### PENDENNIS GOES TO LONDON TO WORK FOR FAME AND FORTUNE

After a time, Arthur Pendennis seemed suddenly to realise that he was still far from doing all that he might to make his mother happy, and as he was by no means an undutiful son, although he too often did the wrong thing, he now determined that he would do the right, by going to London and studying for the Bar. After winning a place for himself in the great city, he would return to fulfil the wish of his mother's heart by marrying Laura.

As Pen had been a spoilt child all his life, and had so often found those who loved him ready to make sacrifices on his behalf, he was now not a little surprised and a great deal offended when Miss Laura saw fit to reject the noble offer of his hand and heart, and when he went to London it was with the feeling that he had been very badly treated. The fact was that the selfishness in his nature had been allowed to grow too strong, and he stood very much in need of a wholesome lesson in conduct. It was as fortunate for herself as it latterly was for Pen that Laura had the good sense to teach him this much-needed lesson.

### PEN WITH HIS FRIEND WARRINGTON, AND THEIR LIFE IN THE GREAT CITY

In London, Pendennis shared chambers with his old friend, George Warrington, a younger son of Sir Miles Warrington. George was one with whom fortune had not gone smoothly. Although in many ways and at heart a gentleman, he had been foolish enough to marry a woman who was unfit to be his wife, and, as a consequence, he had dropped out of the social world in which he should have lived, and here, in London, down at heel and threadbare, he lived a very wretched life, into which Pendennis, with his newly awakened ambitions and his poetic posings, came like a breeze from the old schooldays.

Pen could not have chosen a better companion than the shabby Warrington, who had still the instincts of a gentleman, and could give the young and thoughtless Pen some sound advice, for, despite all his good resolutions, Pen was very soon neglecting his studies and giving himself up to lazy and thriftless habits. His money came to an end too soon for his liking, and it was then that Warrington turned upon him and pointed out the meanness of Pen's life, so much of which had been spent in sponging off his mother, and even accepting the assistance of Laura.

### PENDENNIS DREAMS OF BECOMING A GREAT POET LIKE LORD BYRON

But Warrington did better than this. He suggested to the erratic youth an honourable way of earning money. Himself he was writing for the papers, and so avoiding the need to borrow from friends. Why should not Pendennis do the same, and better? For there was no doubt that he had considerable literary talents. So Pen would be a poet for pay, and earn great sums of money, as Lord Byron had done before him! Warrington laughed at the absurd enthusiasm of Pen, and induced him to fly at smaller game, with the result that the young Squire of Fairoaks was presently making his way as a contributor to the newspapers and magazines, bidding fair to be a successful journalist. Soon he began to consider himself an extremely noble young man indeed, when he was able to send small sums of money to his mother, though these were but very tiny instalments of the debts he owed to her and Laura.

Occasional meetings with Captain Costigan, who was now in London, where his daughter had married an elderly baronet, and who still retailed his fictitious stories to admiring groups of young men, awakened memories of Pen's earlier follies.

### PEN BEGINS TO WIN FAME AS AN AUTHOR AND JOURNALIST

But, although he was not above spending his evenings in the taverns where Costigan and his cronies gathered, he still maintained the grand manner and noble bearing he was supposed to have inherited from his long line of ancestors, much to the amusement of Warrington, whose ancestors, as we know from "The Virginians," had been really distinguished.

Yet Pen held on his course in the new work he had found, and as a journalist and author he began to prosper. A novel which he wrote made his name known, and even the old major, scenting the possibility of fame for his nephew, began to revive his interests in the honour of the Pendennis family.

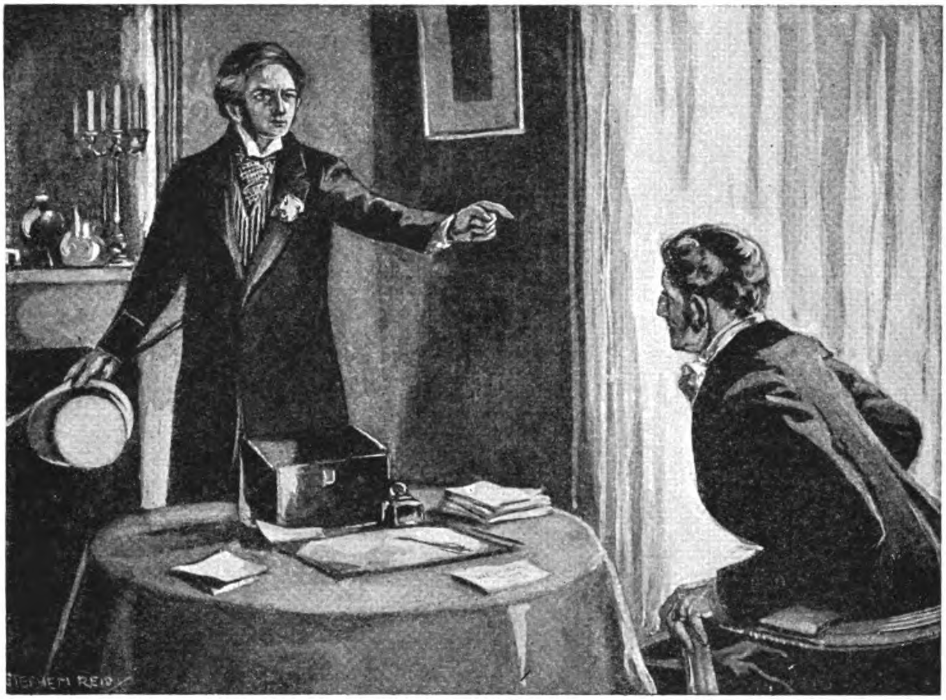
Just at this time Pendennis was stricken with fever, and was lying in a very serious condition at his rooms in the Temple, where poor little Fanny Bolton, the pretty daughter of a Temple porter, had come to nurse him. As soon as the news reached the major, he arrived with all haste at the bedside of the invalid, and there met Mrs. Pendennis and Laura, who behaved none too well to poor Fanny. George Warrington had gone away from town before Pen took ill, and was therefore absent when Major Pendennis and the others came to the rooms he shared with Arthur, but he returned to find the ladies in possession, and to discover in his heart a deep and true affection for the gentle Laura Bell.

### PENDENNIS RECOVERS FROM THE FEVER AND LOSES HIS DEVOTED MOTHER

It was a wonder to him how Pendennis could ever have been insensible to the personal charms and beautiful character of that young lady, for whom he himself would willingly have given the whole world. And Laura on her part recognised at once the true gentlemanliness of Warrington, admiring the strength and independence of his character, and contrasting him with Pen and his dandyism, by no means favourably to poor Pen.

When Pen recovered from his fever, instead of striving to please his devoted mother, who had wept over him and borne with him so long, he acted with his old foolishness by declaring that Helen and Laura had done a great wrong to Fanny Bolton in turning her away from her nursing duties at his bedside, and that he meant to marry the porter's daughter. This was a return to the old stupid Pen, who had thought himself in love with the actress and ready to die for her. The major, of course, was frantic at this new whim, and Mrs. Pendennis was prostrated with grief and weakness; but not until George Warrington had told him of his own unhappy married life, and warned him against the danger of offending those who loved him best, did Pen regain his sober mind and go to his mother subdued. It was almost too late, for

# PEN SURPRISES HIS UNCLE, THE MAJOR



**Trading on a secret, Major Pendennis had got Sir Francis Clavering to resign his seat in parliament to Arthur Pendennis, and to promise a fortune to him if he married his stepdaughter. On getting to know the secret, Pendennis was indignant, and accused his uncle of base conduct. "I'll keep my promise to Miss Amory, sir," said Arthur; "but I will let Clavering off from that bargain that was made without my knowledge. I will take no money with Blanche but that which was originally settled upon her, and I will try to make her happy."**

Mrs. Pendennis, who had been suffering in silence, died as she kissed her son, to whom her whole life had been devoted.

After the death of his mother, Arthur Pendennis was greatly changed, though he was still far from having reached true wisdom. As soon as the period of mourning was over, the major, more anxious than ever to maintain the "honour" of the Pendennises, set about discovering a rich wife for Pen, while Laura now went to live with Lady Rockminster, who had the good sense to understand and appreciate the sterling character of that noble girl.

In the course of his explorations among the rich and titled families of the day, old Major Pendennis found himself a guest at the town house of Sir Francis Clavering when an extraordinary scene took place. A strange person, in a tipsy state, forced himself into the room as dinner was in progress, and created a great disturbance. The stranger was known to some of the party as Colonel Altamount, an adventurer from India; but when his eye caught sight of Major Pendennis, he suddenly reeled towards the door, and was heard to mutter as he fled the place: "Captain Beak! Captain Beak! By Jingo!"

Sir Francis had shown the greatest fear and trembling when this unruly stranger appeared upon the scene, and it so happened that the old major recognised in a flash who this Colonel Altamount was. He had seen him before as one of a convict gang in New South Wales, and had good reason to believe he was none other than Amory, the scoundrel who had induced the present Lady Clavering to marry him when she was Miss Snell. Such was the fact, and Altamount had been preying upon the fears of Sir Francis by making that person supply him with money in order to keep quiet.

Both Sir Francis and Amory were men of low character, and the major, who was none too particular for a gentleman, while caring for neither, determined to make some use of this knowledge he happened to possess. So he made a proposal to Sir Francis Clavering.

### HOW MAJOR PENDENNIS TRIED TO PROFIT BY A SECRET

"I want my nephew to enter public life," he said. "I want him to marry Miss Amory, and I want you to resign your seat in parliament in his favour. Nobody need know anything more about it." And thus we see that in his ambition to have a Pendennis eminent in the public life of his country he did not scruple at driving a bargain with a rascal in a corner.

"It will be easy enough to get rid of Amory," the old warrior thought to himself. "I could put my hand on witnesses who can swear to him, and who will prove that he killed one of his guards in New South Wales. Let my boy marry the heiress, and the rest will be easily done." The fact that his boy would thus become the husband of one whose father was a criminal did not seem to disturb the old schemer.

So it came about that in a few days more the major was able to apprise his nephew of the good fortune that had opened up for him. For it was before the days of honest voting for members of parliament, and people of wealth and position could do pretty much what they liked in obtaining admission to the House. Pen, of course, had no idea of the means whereby Sir Francis resigned his seat to him, and accepted it naturally as a reward for his own great abilities, which he esteemed, perhaps, more than did the world at large.

### THE MAJOR THINKS HIS LITTLE SCHEME IN FAVOUR OF PEN IS SUCCEEDING

Pen did not take his uncle quite seriously when he suggested that Pen should become the husband of Miss Blanche Amory; but none the less he presently found himself a favoured guest of the Claverings, and the old days of exchanging poetry and romantic walks together had come back again; with this difference, however, that Arthur now had the encouragement of Lady Clavering and Sir Francis, and, better still, the rivalry of his old friend, Harry Foker, who, in his simple, stupid way, had fallen in love with Blanche.

Before long, indeed, the major had the delight of knowing that his nephew was engaged to Miss Amory, and the worldly old fellow rubbed his hands with pleasure as he watched the success of his plans. Unhappily for the major, he had reckoned without allowance for the erratic character of his nephew, in whom the impulse to do the straightforward and honourable action was often stronger than the readiness to take a mean course, though his intentions were sometimes better than his deeds.

Judge, then, the consternation of Major Pendennis when his nephew discovered, thanks to the eavesdropping of the major's valet, Morgan, who was base enough to betray the secrets of his master, the real reason for Sir Francis Clavering retiring from parliament in favour of Arthur Pendennis. The major had suffered many shocks and surprises due to the conduct of his nephew, but all were eclipsed by the shock he received when one day Pen burst into his room indignantly and rated him soundly for the mean compact he had made with the baronet.

### PENDENNIS REFUSES TO DO A BASE THING AND RUINS THE MAJOR'S PLANS

"Can't you see, sir," cried Arthur, "that rather than profit by this secret I would go and join my prospective father-in-law in the hulks? Can't you see that you have given me a felon's daughter for a wife, and doomed me to poverty and shame?"

"What, in the name of wonder, can you mean, sir?" asked the major, in a voice that betrayed his pain and alarm.

"I mean to say that there is a measure of baseness which I can't pass," Arthur answered. "I have no other words for it, and I am sorry if they hurt you. I have felt, for months past, that my conduct in this affair has been wicked, sordid, and worldly. I am rightly punished by the event, and having sold myself for money and a seat in parliament by losing both."

"How do you mean that you lose either?" shrieked the old gentleman. "Who is to take your fortune or your seat away from you? Clavering shall give it to you; you shall have every shilling of eighty thousand pounds."

"I'll keep my promise to Miss Amory, sir," said Arthur; "but I will let Clavering off from that bargain that was made without my knowledge. I will take no money with Blanche but that which was originally settled upon her, and I will try to make her happy. You have done it. You have brought this upon me, sir. But you knew no better; and I forgive——"

It was in vain that the old man begged of Arthur, who was now feeling tremendously virtuous and noble, to take a more worldly view of the situation. He even went down on his knees to him, which was an extraordinary effort for the proud old major, but he was desperate at seeing his cherished scheme thus fail to carry. Arthur was determined to do the honourable thing at last, as indeed at all times his better nature prompted him to do. He would not accept the seat in parliament on the conditions his uncle had arranged, but he would stand by his promise to Miss Amory if she wished it.

### IN THE CRISIS OF HIS LIFE PEN SEEKS ADVICE FROM LAURA

In this crisis of his life he fortunately followed the best promptings of his heart by going to Laura and seeking from her, whose gentle nature and calm, clear understanding could give him the counsel and comfort he most needed, advice as to what he ought to do. In the presence of Laura he discovered, at last, that he did not love Blanche.

He had known before that, when it would have suited his purpose to marry her, he had shut his eyes to her faults. Now that he contrasted her with the faithful, unfaltering Laura, to whom he owed so much, he saw only too clearly how vain and heartless was Amory's daughter and how her pretended romantic interests were a mere cloak for a shallow and selfish character.

Though Laura urged him to keep his word to Blanche and to lose no time in telling that young lady he was prepared to carry out his promise, we may have reason to think she was not without hope that Blanche herself might settle the matter differently, for Laura had now come back to something of her old girlish admiration for the splendid Pen, and who can tell what her hopes were at this crisis of his fortune?

Events soon happened that decided the lives of many with whose fortunes we have been concerned. The sudden death of the wealthy brewer, Foker, and young Harry falling heir to £15,000 a year, had a great effect upon the romantic heart of Miss Blanche Amory, who had no hesitation in giving Pendennis his dismissal when he placed himself in her hands. She was now to become the wife of the wealthy young brewer, and great were the preparations at Clavering Park for her wedding.

### BLANCHE AMORY LOSES A HUSBAND BY ACTING DISHONESTLY

Just then Pendennis discovered that Blanche's disreputable father, the ex-convict, was hanging about the neighbourhood, evidently bent on blackmail. Telling her of this, he urged her to let her future husband into her secret; but, afraid of losing Harry Foker and his fortune, Blanche thought it better to keep the matter quiet until she had been married. Unfortunately for her, she could not keep her drunken parent quiet, and that person getting into a scrape, the news reached Foker, who, suspecting that Blanche had known the secret all along and kept it from him, flew into a righteous rage and betook himself far from Clavering Park.

"I would have taken you, whatever you were," he said, in his last meeting with Blanche. "I have loved you with all my heart and soul. But to think that you have been playing with me and cheating me!"

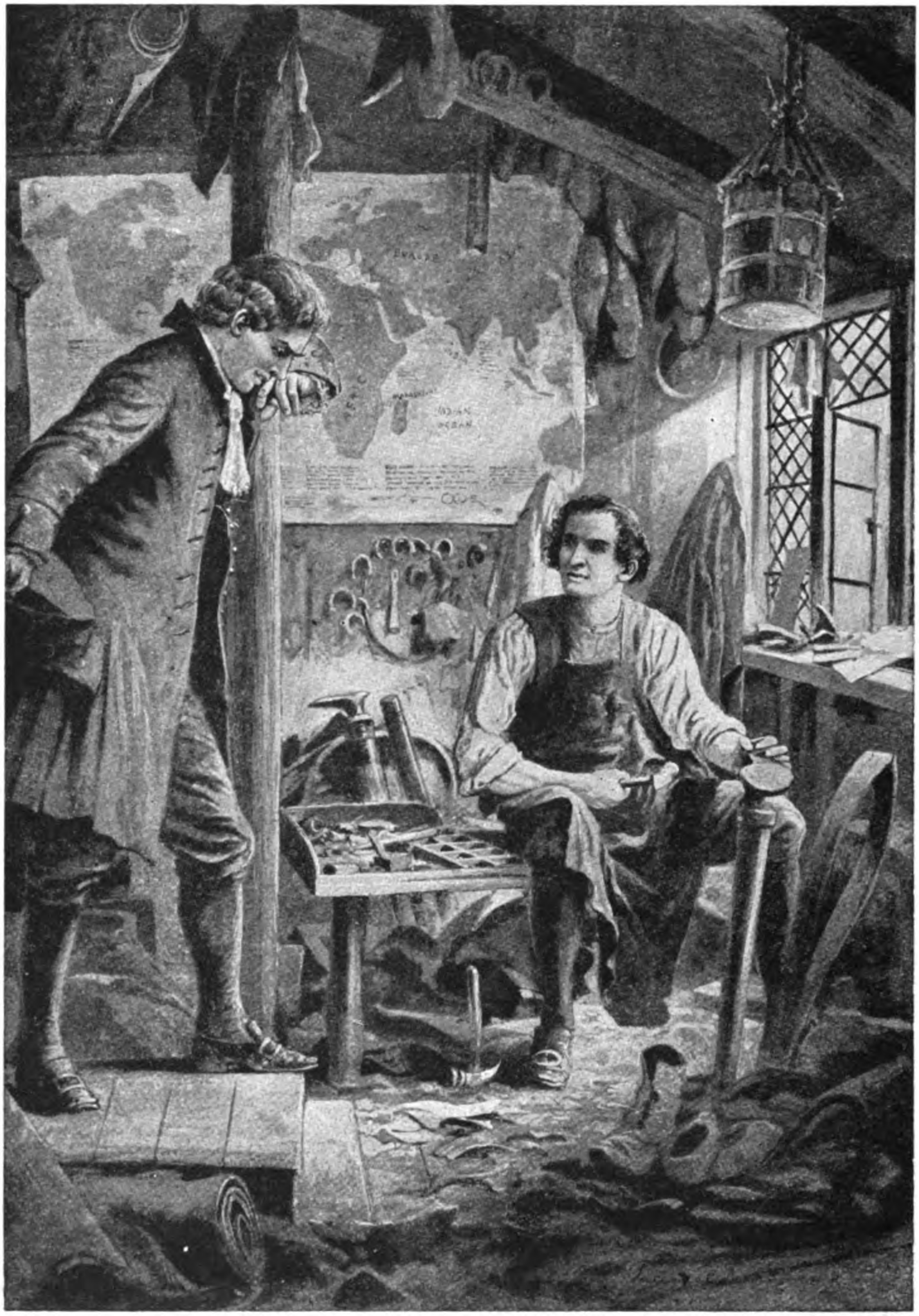
And so it happened that, instead of a brilliant and fashionable wedding at Clavering Church, a very simple ceremony was there observed one day, the bride and bridegroom being — Miss Laura Bell and Mr. Arthur Pendennis.

### ARTHUR PENDENNIS AS A HUSBAND AND A FATHER

"And what sort of a husband would this Pendennis be?" many a reader will ask, doubting the happiness of such a marriage and the fortune of Laura. The querists, if they meet her, are referred to that lady herself, who, seeing his faults and wayward moods, seeing and owning that there are men better than he, loves him always with the most constant affection. His children or their mother have never heard a harsh word from him; and when his fits of moodiness and solitude are over, welcome him back with a never-failing regard and confidence.

The next Famous Books are on page 3603

# WILLIAM CAREY WORKING AS A COBBLER



William Carey, "the father of modern missions," was a shoemaker by trade, but although poor, he educated himself, and became a Baptist minister. Even then he had to make and mend shoes for a living, as shown in this picture, for his congregation was composed of people so poor that they were able to give him only a weekly salary of $1.50. Carey not only inspired earnest Christian men with his own enthusiasm for teaching the Gospel to the heathen, but he won the esteem of the most distinguished men. After he became great and famous, he was once dining with the Governor-General of India, when a conceited youth at the table, pointing to Carey, said insolently to his neighbour: "This fellow was a common shoemaker, was he not?" Carey overheard the question, and he replied in the most gracious tone: "No, sir, not a shoemaker, only a poor cobbler."

# SOME FAMOUS MISSIONARIES

CONTINUED FROM 3338

There are many battles where no gun is fired, and real heroes who wear no red coats, for Peace, as Lord Tennyson sang, has her victories no less renowned than War. Among the world's great heroes stand out the names of many brave men and women who have gone out to teach the Bible to peoples of distant lands, and to carry the blessings of Christianity into uncivilised countries.

The missionary, who fulfils the command of Jesus to His disciples, "Go ye into all the world and preach the Gospel to every creature" cheerfully leaves his native land, his home and his friends, to spend his life where there is no civilisation, no comfort or safety, to dwell with dark-skinned men who worship ugly idols and are given to superstitious and cruel practices. The climate is often deadly, and his health breaks down where no doctor can advise or help; he has to endure hardships and sufferings, and the work of years seems sometimes almost hopeless until he gains the confidence of the natives.

To this consecrated service some of the best students from our colleges gladly give themselves, but we shall see how many of the best missionaries come of humble parents. They have very often been poor boys who have taught themselves, and have had to overcome many difficulties in their early days. They have made all the better missionaries for this, for in their work abroad they have been able to build their own houses and to teach their converts how to cultivate the land and to do other useful work. Of course, they have had to learn the language, and after that have often done good service in translating the Scriptures and many of our well-known hymns into the native tongues. The missionary is the pioneer—the first in the field; he makes it possible for trade to follow in his steps; for the natives will believe in the white men who come on business, because they respect and trust the one who has been their good friend and taught them to live rightly.

Let us look at some of these brave missionaries, whose names have become household words all over the world.

The Moravians are the pioneers of modern missionary enterprise, for although they are a very small body, they have had more than 2,000 missionaries in different parts of the world during the past 170 years. One of the most famous of these was Hans Egede, a young Danish minister of the

Moravian Brethren, who sailed from Bergen, in Norway, in the year 1718, to live among the Eskimos in the frozen North. He landed on the inhospitable shores of Greenland, and soon found how difficult it was to teach people so gloomy and superstitious, and for years he had to endure great hardships with little encouragement.

But he held on, and at one time, when the Eskimos were plague-smitten, he made his house their hospital, and tenderly nursed them, an act of mercy that won their gratitude. Egede was a man of simple faith, and with great humility did his work at a time when there were few missionaries anywhere, and none at all in the Arctic regions. As quite an aged man he returned home to Copenhagen, bringing his wife's remains for burial among her own people, and on November 7, 1758, he, too, entered into his rest.

### DAVID BRAINERD, WHO LEFT ALL TO GO AND PREACH TO THE INDIANS

Another early missionary was David Brainerd, a Yale student who preached to the North American Indians in the colonies of New England. Brainerd was born so long ago as 1718, and his parents dying while he was yet a boy, he began life an orphan and with delicate health. As he grew up, he took to farming, and used to walk his fields bewailing his sins, for he was of a serious turn of mind, and full of self-condemnation. He was treated harshly at Yale College, although there is no name on its roll of greater honour, and he resolved to take the Gospel to all the Indians, who were then, of course, very much more numerous than they are now.

The hardships of travel, the sleeping in the open air, and the scanty food, soon began to tell upon his weak constitution. The language, too, was difficult, and he had to work very patiently at it, riding twenty miles through the dark forests to his instructor, and an offer of a comfortable pastorate among his own people was refused with self-denial. The story of his work among the Indians is one of truest heroism, for he had to work for many years without a glimpse of success. At last the revival came, thousands of the men of the forests came flocking to Brainerd, asking for prayer and counsel, and the heart of this humble servant of God was filled with gratitude. He was an old-fashioned saint, and his journals are a treasure of sweet musings that are read to-day.

### CAREY THE COBBLER, WHO BECAME THE FATHER OF MODERN MISSIONS

But it is to William Carey, the learned cobbler who translated the Scriptures into Bengali, that is due the organisation of missionary work and enterprise in the churches of the English-speaking lands. When the popular idea, and even the belief of clergymen and ministers, was that if God wanted the heathen to be Christians He would convert them in some miraculous way Himself, Carey taught the great truth that it was the duty of Christian men in England and other lands where the Gospel was known and loved to carry out the Divine commission and go and preach to others.

Carey was a country boy, born in the village of Paulerspury, near Northampton, and his father, being parish clerk and schoolmaster, taught his son so well that his mother used to hear him counting in his sleep. William liked books, and was also fond of gardening. Picking up a little Greek and Latin while working as a shoemaker, he became a Baptist minister on $80 a year, and to add to his income still made and mended shoes, and did a little teaching.

One of the outstanding events in modern missionary history is the famous sermon preached by Carey at a meeting of ministers at Nottingham, in June, 1792, that led to the formation of the Baptist Missionary Society, the first organisation of its kind. The text was Isaiah liv. 2-3, and the preacher divided his sermon under two heads: "Expect great things from God," "Attempt great things for God," words that afterwards became the motto of the society.

### A FAMOUS SERMON THAT STARTED THE GREAT WORK OF FOREIGN MISSIONS

The sermon created a profound impression, and the ministers decided there and then that by their next meeting, which was to be at Kettering, in the same year, a plan for the formation of a missionary society should be prepared, and this was done.

Then came his call to India as a missionary for Bengal, but he had difficulty in getting there because of the opposition of officials. Arrived at

Calcutta, Carey found himself and family homeless, friendless, and with scarcely any money. He tried to earn something by planting indigo, and at once gave himself up to the translation of the New Testament into Bengali, and became so proficient in that language that he was appointed one of the tutors in Fort William College. Through his efforts, joined with those of other missionaries, the government passed a law forbidding the burning of widows, and during his forty years of splendid Christian labour, he earned the position of distinction which he holds in the history of missionary enterprise. A domed tomb of solid stone, in the cemetery at Calcutta, marks his resting-place, the only inscription, at his own request, being his name and the date, with the words:

> A wretched, poor, and helpless worm,
> On Thy kind arms I fall.

Another noted missionary to the people of India was Henry Martyn, the Cambridge student, who travelled also in Persia. He was a Cornish boy of Truro, but was so weak in body that it seemed impossible that he would make any mark in the world, or live to find himself famous. But at St. John's College, Cambridge, he showed great aptitude for study, and it was during a vacation spent in Wales that his heart responded to the call to enter the mission field. While at the university, he became fast friends with another deeply religious student, Henry Kirke White, the Nottingham poet. After his father's death, Martyn had to make some provision for his sisters, so he went out to India as a chaplain under the Board of the East India Company. On the voyage out he preached to the crew, and spent much time in learning Hindustani. After a short stay at the Cape he reached Madras on April 22, 1806.

In his Indian work he met with great opposition, not so much from the natives as from the English officials, civil and military, but he persistently laboured on, translating the Bible with his faithful moonshee, or teacher, by his side. He also turned his eyes towards Persia, and with great pains and patient scholarship translated the New Testament into Persian, travelling in that country that he might get to know and thoroughly understand the people.

When Henry Martyn was a missionary in Persia, he attended one day the Vizier's levee, and a great discussion upon religion took place. At last Martyn exclaimed: "Jesus is the Son of God," and in a moment the place was in an uproar. It was with the greatest difficulty that he escaped, and that he was able to save the sheets on which were written his translation of the New Testament into Persian, that had cost him weeks of labour.

The Mohammedans, however, treated him and the Bible that had cost him so much labour to translate with scant respect. Finally, in a time of plague and fever, he passed away at Tokat, in October, 1812, writing: "O Lord, Thy will be done! Living, dying, remember me!" Lord Macaulay wrote his epitaph, and he is counted as one of the saints of the great missionary Calendar.

Robert Morrison, like Carey, was a shoemaker, and it was he who translated the Bible into Chinese. It often happens that a missionary has one part of the world in his mind, and yet goes to another. Livingstone's original intention was to go to China, but he went to Africa. So Morrison, who meant to follow Mungo Park to Timbuctoo, found his real sphere in China.

### ROBERT MORRISON, WHO GAVE THE CHINESE PEOPLE THE BIBLE

As a youth he learnt his father's trade at Morpeth, but, before going abroad, he not only became a medical student at St. Bartholomew's Hospital, but found a young Chinaman in London, who taught him his language, and also showed him the sort of people to whom he was going to preach across the distant sea.

Arriving there, he let his hair grow, and wore a pigtail, and tried to live like a Chinaman until his health failed. His great work was the translation of the Bible; but he also gave the English Prayer-book to these people in their own tongue. But he was of great service to the English government in difficulties which arose with the Chinese, and at one time he was the secretary and interpreter of the consul. Before he died, in 1834, Morrison had finished his great dictionary of the Chinese language in six quarto volumes. To-day, all the Christian workers and their converts in China read the Bible he left behind.

John Williams, known everywhere as "the Martyr of Erromanga," was a young blacksmith. It was in City Road, London, that he swung the hammer at the forge. One Sunday night in 1814 a good old woman took him to the Moorfields Tabernacle, which led to his conversion, and to his future career as a missionary.

### THE MARTYR OF ERROMANGA, WHO BUILT A HOUSE AND A SHIP WITHOUT TOOLS

He had little education, but was quick-witted, and impressed people with his honesty; he had also the knack of sticking to a thing, otherwise he would never have mastered the language of Tahiti, in the Society Islands, where he first went to preach the Gospel. He taught the natives some valuable lessons in handicraft, as they watched him build first his house, and afterwards his mission ship, the Messenger of Peace, with scarcely any tools. Perhaps the most difficult task was to make a pair of smith's bellows of goat skins, which the rats ate before morning.

In his boat, with mat sails, he made dangerous voyages from time to time, thousands of natives, who loved him, bidding him farewell with songs of sorrow. Six times Williams was nearly drowned, the sea waves dashing his vessel on the rocks. He was spared, however, to evangelise these South Sea Islands, and translated the New Testament into Raratongan. He went home, after many years, to plead the cause of these poor people in England. Returning on November 20, 1839, he landed with three companions on the shore at Erromanga. But the natives were hostile. A big savage struck Williams on the head, killing him, and a shower of arrows followed. In a few moments "the rippling water was red with the blood of the noblest man that has ever gone to those far-off isles of the South Sea, laden with blessings for the ignorant and outcast."

### THE SAILOR WHO CARRIED THE GOSPEL TO THE END OF THE WORLD

When George III. was king, young Allen Gardiner, the middy who took Christianity to the wild Patagonians, had his first taste of the sea in wartime. Later, he bought a Bible at a second-hand shop, the reading of which changed his whole life, and he went out to Africa, after many dangerous adventures, preaching the Gospel to Dingan, the Zulu chief, over whom he exerted a good influence. After a time he sailed for Brazil—for South America was in great need of the Gospel—and earnestly worked among the Indians of Chili. Several times he nearly lost his life, but, nothing daunted, he resolved to visit Tierra del Fuego, and landed among the Patagonians with a few brave companions. He found these people very degraded, as Darwin had described them, but, with infinite patience and faith, Gardiner tried to bring light to their dark hearts. The closing days of this brave life were very pathetic. Landing at a certain point, he and his helpers found themselves without food. John Pearce, one of the number, crawled along the beach to say that Joseph Erwin had not spoken for two days, and when Gardiner, after a painful struggle,

# THE PERILS OF THE MISSIONARY'S LIFE

Over and over again, Dr. Paton, the missionary to the New Hebrides, had to rush into the arms of some fierce savage who was about to kill him with his club, and cling round the man until his wrath abated.

Hans Egede, who carried the Gospel to the Eskimos, walked about Bergen for nearly four years before he could persuade anyone to convey him to Greenland. Here we see him gazing wistfully at a departing ship.

There is no sadder story in missionary history than that of Captain Allen Gardiner, who went to preach to the Patagonians. Landing on the inhospitable shores of Tierra del Fuego, he and his party found the natives hostile. Disease attacked the missionaries, their stores ran out, and they starved to death. Captain Gardiner himself died of exhaustion by the side of his boat, where his remains were found by those who came with relief.

The photographs on page 3483 are supplied by Fradelle, the London Missionary Society, the Church Missionary Society, and others.

reached the place, Erwin lay stiff and cold. Still another, John Bryant, was found cold and dead, with a smile upon his face, not far away.

### THE BRAVE MEN WHO WAITED FOR THE HELP THAT NEVER CAME

Thus died they all, waiting for the help that never came. A month afterwards an English ship anchored by the still shores of Tierra del Fuego. All was silent in that dreary region. Along the beach the faithful martyrs lay. The captain cried like a child at the awful sight.

Gardiner had fallen down by the boat, too weak to climb back again, and scattered on the beach were the papers on which he had written in pencil the story of their sufferings. Written on the rocks were the words: "My soul, wait thou only upon God, for my expectation is from Him," painted there by Allen Gardiner as he lay, racked with pain, waiting for death.

Robert Moffat was a young gardener, and he became the pioneer missionary of South Africa. He was born at Ormiston, in East Lothian, on the shortest day of 1795, and his early days were divided between his Latin grammar, the blacksmith's hammer, and his violin. Afterwards he became an under-gardener in Cheshire. Seeing a placard of a missionary meeting, he attended, and this so influenced him that, after much prayer, he offered himself as a missionary.

He sailed for the Cape on September 18, 1816, and his first work, having learned Dutch, was with the farmers and the poor Hottentots, who were little better than their slaves. He visited Africander, "the Bonaparte of South Africa," and greatly influenced him for good, bringing him down to Cape Town, to the astonishment of the Dutch. He then founded the mission stations in Namaqualand, and worked among the Bechuanas at Lattakoo.

### HOW ROBERT MOFFAT WENT TO LONDON AND PREACHED IN THE ABBEY

He translated part of the New Testament into the Bechuana language, and returning for a visit to England in 1840, he was able to translate some of the Old Testament, including the Psalms. In the year 1873, as a tall, white-bearded old man, he was invited by Dean Stanley to speak at Westminster Abbey, and a great crowd listened with reverence to his thrilling story of work among the natives of South Africa.

His later work was at Kuruman, where his daughter married Livingstone, and at last, with his faithful wife, he returned home, and died full of years and public honours in August, 1883, the veteran apostle of the mission field.

We read about David Livingstone, the Scottish weaver boy, whose heart was buried in Africa, on page 282. We are not likely to forget his honoured name, and on the floor of Westminster Abbey, where the sunshine falls through the stained windows, we find his grave; but his heart is buried in the land he loved so well.

We read of Bishop Crowther, the black slave boy who became a bishop, on page 2910. of this book. There have been few histories of the mission field equal in interest to the life of this black bishop. He was a marvellous example of what a negro may be and do in the service of God and man.

### A SCHOOL FRIEND OF MR. GLADSTONE WHO BECAME A MISSIONARY BISHOP

Bishop Selwyn, the athletic student who worked so hard in New Zealand, was born in an old-fashioned rectory at Hampstead on April 5, 1809. After some preparatory schooling at Ealing, the boy, who, one day, was to be a bishop, was sent to Eton, where he made friends with many who, like himself, became in later years great men. His school chum was Mr. Gladstone, and that friendship remained till the very last. Here, and afterwards at the university, Selwyn was first in all the sports. It was said of his good nature that "he always took the labouring oar in everything." He could dive like none other, and in the grounds was "Selwyn's bush," over which he leapt and turned a somersault into the river on the other side. In due time he became a curate at Windsor, and was consecrated Bishop of New Zealand on October 17, 1841.

The Maoris were not yet settled to English rule, and in the conflicts that often occurred the personal influence of Bishop Selwyn counted for much. The Maoris trusted him, and he was peacemaker often at great risk to himself. "I am your mediator," he used to say to them. "I have eaten your food, slept in your houses, talked with you, prayed with you; let us dwell together with one faith, one love, and one Lord." He travelled through the country, and once, after visiting an island, he brought two little girls back with him, arrayed in garments made by himself out of an old quilt.

### BISHOP SELWYN'S DEATH, AND HIS INFLUENCE OVER AN ETON BOY

Afterwards he came home, and became Bishop of Lichfield, where he worked hard, and at last, on April 11, 1878, lay a-dying. Calling some children to his bedside, he said softly: "I wish you were little robins so that you might sit on my finger." Soon afterwards he whispered in the Maori language: "It is light," and, smiling, passed to the land of everlasting day.

Bishop Patteson, the Eton boy, who was martyred in Melanesia, was a Devonshire lad, fond of books and of a good game of cricket. Young Patteson went from Ottery St. Mary to Balliol College, Oxford, where he studied hard, and was played as captain of the eleven. A long holiday, spent in travelling on the Continent, opened his mind, but it was hearing a sermon by Bishop Selwyn, in the parish church of New Windsor, that inspired him with the desire to be a missionary; and eventually, as a young clergyman, the bishop took him with him to work among the islands of Melanesia. Here for years he laboured, preaching the Gospel and specially caring for the native lads, whom he loved and trained as teachers, on Norfolk Island. A man of great courage, Patteson used to visit the islands, sometimes swimming through the surf, often at great personal risk.

### HOW THE CANNIBALS OF MELANESIA KILLED THEIR BEST FRIEND

He tried to protect the natives from being kidnapped by white men, but one day, when he had landed alone among a crowd of infuriated cannibals, he was killed, and his body, with five wounds and five sprays of palms upon his breast, was floated out to the ship. A beautifully carved pulpit to his memory stands in Exeter Cathedral.

Another bishop, Dr. Steere, known as the fishermen's parson, went to Zanzibar. For many years the slave-market of East Africa was at Zanzibar, and Bishop Tozer had striven to educate the poor boys who came into his hands from the sultan. Now, upon this spot where miserable people were sold into slavery, a handsome church, with a high steeple, stands, the cathedral of Zanzibar, which was built by Bishop Steere. He succeeded to the bishopric when Bishop Tozer resigned, and had come out from England, where he had worked among the poor. He was rector of Little Steeping, near Skegness, and the fishermen of his parish called him "a downright shirt-sleeve man and a real Bible parson."

He first went to Zanzibar in 1862, and after translating part of the Scriptures into Swahili, returned home, and returned again as Bishop of Central Africa, having been consecrated in Westminster Abbey, in 1874. He spoke many languages—French, German, Portuguese, Italian, Spanish, besides the native dialects. On August 28, 1882, he was buried in his cathedral church at Zanzibar.

### THE BRAVE BISHOP HANNINGTON, WHO DIED A MARTYR IN UGANDA

Bishop Hannington, the merry schoolboy, who died for the faith in Africa, was such a cheerful youth that they called him "Mad Jim" at school, and all through his life this happy-heartedness never left him. He had a pleasant curacy in Devonshire, and then went to Hurstpierpoint, in Sussex, where, though married and settled with his family around him, the call of God came to Hannington to go to Africa as a missionary. He landed at Zanzibar in 1882, and travelled up the country, through dense forests, perils by robbers and wild animals, and eventually reached Uyui, near to the spot where Stanley had said good-bye to Livingstone some years before. Whenever he met the chiefs he preached to them of Christ; and after reaching the Victoria Nyanza Lake he turned homewards, and was in England again after a year's absence. But, in 1884, he went out again to Equatorial Africa, laboured at Uganda, was captured by a treacherous chief, and, after declaring to the natives that he was ready to die for Uganda, was shot with his own gun.

Another devoted missionary who died at the post of duty in Uganda was a young engineer named Alexander Mackay. He was never anything but plain Mr. Mackay, a young man with an apostolic spirit and a large heart of grace and faith. Born a Scotsman, in a Free Church manse, he studied hard for his profession, both in Edinburgh and Berlin, reading also good books, but never neglecting the Bible his mother gave him when he left home.

### THE ENGINEER WHO BECAME A MISSIONARY AND WOULD NOT COME HOME

He was always a strong character, and when he was in Uganda, faced by worries and persecutions enough to daunt anybody, his spirit was undismayed. He passed through the terrible experiences of those early years when he dealt with not only "the heathen in his blindness," but the Moslem and Roman Catholic factions which opposed him vigorously.

Mackay told his wonderful story in his letters home, never making much of his part of it, though he was really the hero of many a struggle. He wrote articles trying to open the eyes of his friends in England to the real needs and troubles of Africa, all the while he was working away at practical things, with his heart full of the love of God. Mackay always thought of himself last. In one of his letters he said: "But what is this you write—'Come home'? Surely, now, in our terrible dearth of workers, it is not the time for any of us to desert his post." Mackay died of fever on the morning of February 8, 1890, still young in years, but in Christian service almost a veteran.

James Chalmers is often spoken of as Tamate, the name by which he was known in New Guinea. When he first landed, a native called out: "What fellow name belong you?" "Chalmers," was the answer. "Tamate, Tamate," the native shouted as he ran back to his companions. This is how he came to go to New Guinea. His father, who gave him sixpence for learning the 23rd Psalm, was a stonemason in Argyllshire, and sent the boy to Sunday-school, where he heard from his teachers of the need of help in Fiji.

### HOW JAMES CHALMERS WAS KILLED WHILE TRYING TO MAKE PEACE

Coming home he determined to answer the appeal. From that time his face was turned towards the mission field. After going to Cheshunt College he was ordained at East Finchley, and in due time started for Samoa and Raratonga, in the Pacific. He took with him a good, brave wife, who shared his trials. His work among the cannibals in these islands was rendered more difficult by the strong drink they took, that Europeans brought to them. But he loved the savages, though he often stood in great peril when dealing with strange chiefs, who tried to rob him and threatened his life with their clubs and spears. But Tamate, unarmed, defied them, and lived to be a white-haired old man. Then, one day, hearing of trouble among the natives on Goaribari Island, he went up the Fly River, and, in his fearless way, walked among them, seeking to make them quiet and peaceful; but they knocked him down and speared him, and afterwards feasted upon his body.

John G. Paton, a Dumfries laddie, became the Apostle of the New Hebrides. He won this title of honour by living among the natives of these islands until his hair was white, gaining their love by his patience and helpfulness, and teaching them how the grace of God could make the very worst of men good.

### THE RAIN THAT CAME UP FROM A HOLE IN THE EARTH

He left Glasgow as a young man, and the chief of the Island of Tanna told him the fever would soon kill him; but his life was mercifully spared not only from disease, but from the clubs of these cannibals; for he was not afraid to stand between quarrelling tribes; and on one occasion his house, with all his books and medicines, was burnt to the ground.

Paton believed in prayer, and one of the wonderful stories he used to tell was how, when all the natives were suffering from drought, he dug a well in sight of them all, asking God to send water. The people had never heard of such a thing, and one chief said to Paton:

"No, missi; you will never see rain coming up from the earth on this island. We wonder what is to be the end of this mad work of yours. We expect daily, if you reach water, to see you drop through into the sea, and the sharks will eat you! That will be the end; death to you, and danger to us all."

When at last the water came in refreshing springs, the people brought their idols and burned them, promising to worship only the one true God.

The next Men and Women begin on 3567.

# The Child's Book of SCHOOL LESSONS

## READING

# THE DIFFERENT KINDS OF MOODS

CONTINUED FROM 3428

Do you ever watch the birds flying along so gracefully and easily, the swallows skimming the surface of a lake, or the crow flip-flapping far above your head? Have you ever seen a hawk hovering ever so high up—how he moves his wings just once or twice, and then glides on a long way with his wings quite still and motionless? If so, I am sure you must have envied them, and said, "Oh, it *would* be nice to fly!" But if one of the birds were to speak to you, he would not say that, but he would say, "Yes, I fly very nicely, do I not?" And then he would look quite conceited, and think himself ever so much cleverer than you, because he can fly right over the church steeple while you have to walk or run on the ground.

Now, what is the difference between those two sentences: "Oh, it *would* be nice to fly!" and "I fly very nicely"? I think you can see at once (that is, if you remember our last talk) that the word "fly" in the second sentence is in the Indicative Mood, for it simply states a fact. You will also see that it has the pronoun "I" joined with it, making "I fly."

Now, in the first of those two sentences there is no pronoun with the word "fly"; you read only "to fly," not "I fly," or "He flies," or "The bird flies." So we see that some parts of a verb are used with nouns or pronouns, while other parts are used without them (generally with the word *to* in front of them). All the parts that have nouns or pronouns with them (as "I walk," "Fire burns," "Go ye") are said to be Finite (that is, limited) Moods, while the other parts are said to be not-finite or Infinite, because they are not limited by any noun or pronoun. The Finite Moods are the Indicative Mood, the Imperative Mood, and one that you have not learnt, the Subjunctive Mood. All the other parts of the verb are Infinite.

This is rather hard, I know; but perhaps these examples will make it easier. The words printed in capital letters are Infinite, or in the Infinitive Mood, as it is sometimes called:

TO WALK is easier than TO RUN.

David used TO KEEP his father's sheep.

Baby wants TO PLAY with my top.

I can JUMP over this gate.

Perhaps some of you will say, "In this last sentence there is a pronoun I with the verb jump, and therefore it is a finite mood." But the pronoun does not go with "jump," but with "can," and you will see it quite clearly if we write "I am able TO JUMP over this gate" instead. Nearly all parts of a verb with TO in front of them are Infinitive.

You will often hear people say, "I will try and do it," but that is not right. We ought to say, "I will try TO DO it," for DO is really in the infinitive mood after TRY, and the second sentence shows it clearly.

Now, can you pick out the Indicative and Infinitive Moods in these funny verses ? If you have carefully read what has gone before it should be easy.

I like to walk along the street,
But you prefer to run;
I always ask for cake to eat,
While you select a bun.

And when I stand upon my head
I see things downside up:
The bedclothes underneath the bed,
The saucer on the cup

But when upon your head you stand
You see things upside down;
The sea is washed by solid land,
The river's on the town.

We can't agree, 'tis sad to say,
We seem to differ quite,
For you prefer to sleep by day,
And I to wake by night.

## WRITING

# TOM AND NORA USE SMALLER CRUTCHES

"You have got on so well with words and numbers that to-day we are going to do something new—something you will like, I know, because if it is well done the two letters to Cousin Jack will be written next week," Tom and Nora were told by their mother, when next they came with their books and pens for their writing lesson.

"All this while," she said, "we have been using crutches, or, as Tom calls them, railway lines; but now is the time to see if we can do with closer railway lines. We shall have to be very careful to keep the letters the same size, for it would be dreadful to have to take to wide lines again when we can walk nicely with narrow ones if we try.

"So now we will just rule lines close together, and write little sentences with smaller letters. You will be able to write them easily if you are quite careful about the size of the letters."

This was the first sentence which was written for Tom and Nora to copy:

*Kind words are like pearls*

Nora read the words, and, while dipping her pen in the ink, thought it would be nice to have pearls of that kind to give away.

Tom remembered when he came to l and k that their loops were a little longer than the long stroke of d, but that p was short above and below the line. His mother pointed out that none of the small letters had loops so high as the capital letters.

"We will see how you remember the height of these letters," she said, as she wrote for them two more sentences.

*The river flows very quickly by*

*Many hands make light work*

"In these two sentences we find just what we want to bring to mind: the proper height of the small letters. The loops below the line will not trouble us. They are all equal; it is only p that has a short tail. We can remember that by thinking p begins puppy, for we expect a puppy to have a shorter tail than a grown-up dog."

"Mother, will you tell us how we can remember the tails of capital letters ?" asked Nora presently.

"Let us look at them," was the reply.

Nora turned up her pages of capitals, but she could only find Y, Z and G with tails, and as they were all alike and just the same length as those of the small letters, Nora thought she could not forget them.

"They can't be vain like the peacocks, Nora," said Tom; "you see, they are all alike."

"A useful thing to be able to do," said their mother, "is to write figures like printed ones, because they can be made so clean, and we can write them on parcels, tickets, or the covers of books. We will take the figures 0 to 9, because, as you know, all numbers are made from these."

# 0 1 2 3 4 5 6 7 8 9

"The figures are very upright," said Nora.

"Yes," replied her mother; "broad and upright, and very plain and nice to read. If we look at them carefully, we can easily see how they are made. Four is made with three straight strokes. See how the down-stroke of seven gets thicker at the bottom and how eight is in two halves. Which do you think is the same figure as another one, but turned upside down? Like kitty, it looks as though it tried to run after its own tail."

"It must be six," exclaimed Nora. "Why, yes, mother; if it runs round after its tail, it does make nine! See, Tom! Isn't it so?"

ARITHMETIC

# HOW TO DO "LONG DIVISION"

We have now to consider division by numbers which are greater than 12, and which cannot be split into factors as small as 12. Let us first try to divide 3266 things into 23 equal groups.

First, the given number contains 3 thousands. But there are to be 23 groups, so it is clear that we cannot put a thousand into each group. But 3 thousands make 30 hundreds, and these, with the 2 hundreds in the given number, make 32 hundreds. Evidently this is sufficient to enable us to put 1 hundred into each group, because that requires 23 hundreds only. We should have 9 of the hundreds left, and these are not enough to give us a second hundred for each group. This is the end of the first stage of our work.

Next, the 9 hundreds which were left make 90 tens. The given number contains 6 other tens, so that we now have 96 tens. We have to find how many tens we shall be able to put into each of the 23 groups, and yet not use more than 96 tens. A little later we shall learn how to find this fairly easily; but for the present we must be content to see that to put *one* ten into each group uses 23 tens; to put 2 tens into each uses 2 times 23, or 46 tens; to put 3 tens into each uses 3 times 23, or 69 tens; to put 4 tens uses 4 times 23, or 92 tens. There are now only 4 tens left. Thus, we are able to put 4 tens into each of the 23 groups. This is the end of the second stage of our work.

Finally, we have 4 tens, which make 40 units, and the 6 units of the given number, making 46 units in all. By counting a unit into each of the 23 groups, in the same way that we counted the tens, we see that we are able to put 2 units into each group. This is the end of the division.

Altogether, in each group we have put 1 hundred, 4 tens, and 2 units. That is, each group contains 142 of the given things; so that 3266 things, when divided into 23 equal groups, give 142 things for each group.

Now let us see how this process can be expressed in writing. It is usual to place the dividend between a pair of brackets, turned outwards. The divisor is written in front of the first bracket.

```
23)3266(100 +40 +2
   2300
   ----
    966
    920
    ---
     46
     46
    ===
```

As we have already seen, out of the 32 hundreds we can place *one* hundred in each of the 23 groups. We therefore write 100 to the right of the second bracket. Then we multiply the divisor, 23, by this 100, which tells us that we are using 2300 in our 23 groups. We write this 2300 under the dividend, 3266, and subtract. This shows that we have now 966 of the original things left. The second stage of our previous work showed us that, of these 96 tens, we can use 92 tens in putting 4 of them into each group. Therefore, we write 4 tens, or 40, in our answer; multiply 23 by 40, and after writing the result, 920, under the 966, we again subtract, and find we have now 46 things left.

The third stage of our work showed us we cou'd, out of these 46 units, put 2 units into each of the 23 groups. So we now write 2 units in our answer, multiply 23 by 2, giving 46 units. The subtraction shows that we have now nothing left, and therefore we have used the whole 3266 things, and have put into each group 100 things, and 40 things, and 2 things—that is, 142 things altogether.

Now that we understand the principle of the process, we can see that we need not write down as many figures as we have been doing.

First, the *position* of the 2 and the 3 in our first multiplication, 2300, shows that 23 must stand for 23 *hundreds*. Therefore, it is unnecessary to write the 00. In the same way, we need not write the 0 at the end of 920, since the position of the figures again shows their value. Next, the three stages of our work have consisted of dividing, first the hundreds, then the tens, then the units. Thus, at the second stage, say, we are not dealing with *units*, so we need not write down the unit's figure, 6, of the number of things, 966, which we have left at that stage. We "bring down" the figure from the dividend as we require it.

Finally, the "answer" need not be written as we wrote it at first, 100 +40 +2, for when we divide the hundreds, and see that we can put 1 hundred into each group first, we know that we shall then proceed to tens, and, last of all, to units. That is, we know that there will be three things to put in the "answer," so that instead of 100 we write 1 only, and the two figures which have to follow will make this 1 mean 1 hundred. The work will therefore be like this:

```
23)3266(142
   23
   —
    96
    92
    —
     46
     46
     —
```

(1) Take as many figures of the dividend as will make a larger number than the divisor. In this case, two figures, 32, make a larger number than 23. To find what figure goes in the answer, use only the first figure of each of these numbers. Say, How many 2's in 3? Evidently, 1. Put 1 in the answer. Multiply 23 by 1. Write under 32, and subtract. The remainder is 9; really 9 hundreds, but we need not trouble about that.

(2) "Bring down" the next figure, 6, from the dividend, writing it after the remainder, 9. We have now to divide 23 into 96. Say, as before, How many 2's in 9? There are 4. Put 4 in the answer, after the 1 which is already there. Multiply 23 by 4, and write the result, 92, under the 96. Subtract. The remainder is 4.

(3) Bring down the next figure, 6, from the dividend. This gives 46. Say, 2 into 4 goes 2. Put 2 in the answer. Multiply 23 by 2. Write the result, 46, under the other 46. Subtract. There is no remainder. We have no more figures to "bring down," so the division is finished.

Answers to Examples on page **3426:**

**1.** 26347. **2.** 185786. **3.** 102051

**4.** 820. **5.** 22707. **6.** 126.

MUSIC

# A FIRST LITTLE EXERCISE

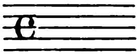
THERE is so much to learn in music that no one book in the world can tell it all; and now that we are getting on so well we must buy a little book that will make our learning easier, because it gives us a great deal that there is not room for in an encyclopædia. There are many books that will do this, of course, but the one we shall refer to is called "L'Indispensable," published by Messrs. Ashdown, Hanover Square, London; Robin Ellis, New York.

It was written by Aloys Schmitt, who is well acquainted with the little fairies and has done his best to help us get our fingers ready to do the fairies' bidding.

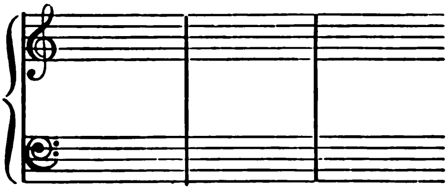
We begin by looking very carefully at Exercise I., and we will call it "The Fairies' Drill." They want all our fingers to be quite free, and equally strong—in fact, each must be as the other. But first of all we must understand all about this little exercise.

We notice the little brace {, which tells us that the fairies in the treble and the fairies in the bass are going to sing together, so when we have found out what each hand must do, we shall play them at the same time. We see the little figure known to us as Treble Clef directing us to the notes on the treble staff, and we see the little figure which we know to be the Bass Clef showing us our way to the notes on the bass staff.

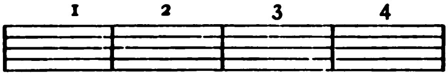
Now we come to something we have not seen before, the little sign written

like this 

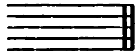
It is really a broken circle, but before we can quite tell what the fairies mean by this little C we must find out something else. If we look at the exercise we notice little lines going straight down through the treble and bass staves.



It is just as if the fairies wanted little fields of sound, each field to be the same size, and each one within its own little railing. Yes, it is quite true that all music to-day is written in this way. The little lines have a name all their own; they are called *bar-lines*, and the space between the bar-lines is called a *bar*. Here is a picture of four bars—four of the fairies' little fields.



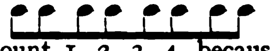
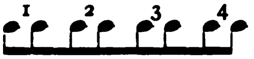
These bar-lines help us very much, because when we are first reading one of the fairies' letters we know we are to make the first note after the bar-line—that is, the first note in each bar—a little louder than the other notes. We shall have to press that particular note a little more, and the fairies call this pressure *accent*. We must take still another look at this first little exercise, and we shall find something

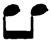
that looks like a double line 

This is to tell us that the fairies have come to the end of this first little bit of drill, and they call it a *double bar*. But what has all this to do with the little sign we were talking about, C? Just this. We said the fairy fields of sound have to be the same size. Sometimes the fairies have a game of play, and move their railings, or bar-lines, but then they tell us they intend to do so. Sometimes for quite a long time you will find their railings are placed at equal distances, and each little field is the same size as the other. The fairies are so thoughtful that they have signs to guide us in every direction, so that we may always know what they want. They show us the size of each little bar by signs or figures placed at the beginning of their letters. These letters we call *pieces* or *exercises*. So our little C is placed at the very beginning of this particular exercise to tell us how many we must count to carry us through the two little bars we are going to play. It is called a *time signature*—that is, the sign that will tell us the time we are to keep.

C is called *common time*, the time that is used the most in music, and it means that each bar contains the value of four crotchets. Now, if we remember the game we played with King Semibreve, the Lords Minim, the Masters Crotchet, and the little quavers, we shall be able to think and say quite quickly: One semibreve is worth four crotchets. So in this little exercise each bar is big enough for King Semibreve 𝅝. Two minims are equal to one semibreve—𝅗𝅥 𝅗𝅥 equal 𝅝. So, if King Semibreve wishes to rest, each of these bars can take two minims.

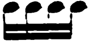
Four crotchets take up the same time as two minims or one semibreve—𝅘𝅥 𝅘𝅥 𝅘𝅥 𝅘𝅥 equal 𝅗𝅥 𝅗𝅥 equal 𝅝; therefore, in these two little bars, we may, and do, count 1, 2, 3, 4.

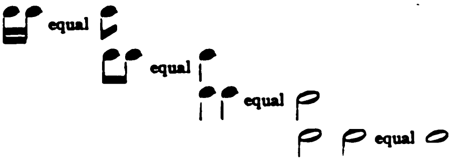
It is quite possible for four little crotchets to give way to eight little quavers, , and still we count 1, 2, 3, 4, because for every crotchet we have two little quavers. So they have to trot a little quicker, , and we see that

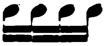
 equal 𝅘𝅥

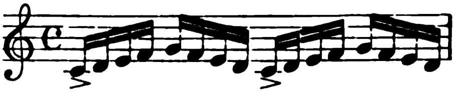
𝅘𝅥 𝅘𝅥 equal 𝅗𝅥

𝅗𝅥 𝅗𝅥 equal 𝅝

If we look at our exercise again, we see sixteen little black notes, and each note has a double tail . This tells us that they are even smaller and less important than the little quavers. The fairies whisper, "These little notes with a double tail are *semi-quavers*, and it takes two semi-quavers to represent one quaver." Semi means half, and these wee notes are just nothing more or less than half-quavers. So as our bar can take eight quavers, if the quavers take a holiday (as they evidently have done in this little exercise), and tell the little semi-quavers to take their place, we find ourselves with sixteen little semi-quavers, and we can make our little list of notes still longer :



So we see that we want four little semi-quavers to make one crotchet. There are four tiny groups. Each tiny group must represent a crotchet; so as semi-quavers are on duty, each little group contains four semi-quavers, because  equal , and this is how we count :



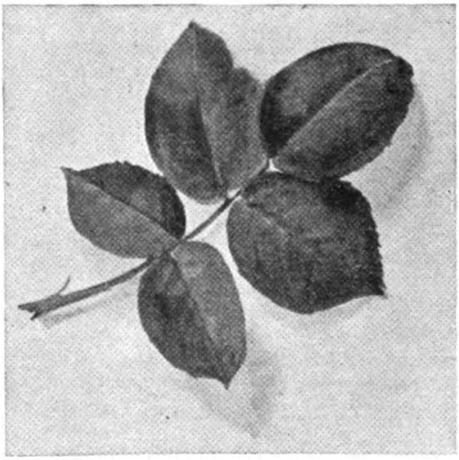
The fairies want us to press the very first note of each bar, so that those who hear us may know it is the beginning of the bar; and when we reach group 3 we give another gentle little pressure, not so much as on the first note of all, but just enough to show us we have got half-way through the fairies' field—that is, that we have reached the half of the bar, and anyone who hears us will know we are playing in common time, or four crotchets in the bar.

Next time we are going to think of the notes, and how to make our fairies give us the lovely tone we want so much to hear.

DRAWING

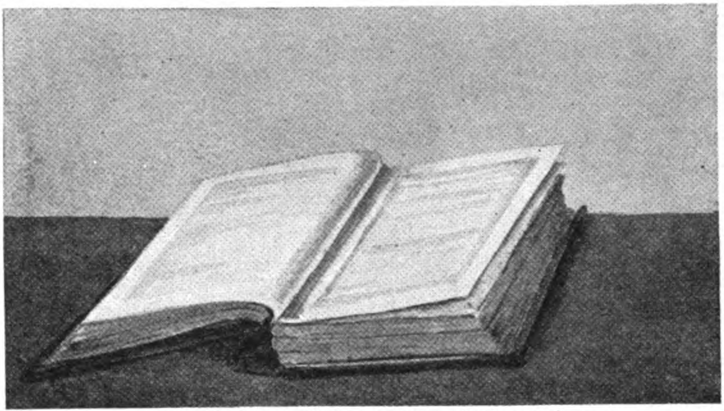
# THE RIGHT WAY TO USE COLOUR

There was once a little girl who was very fond of drawing. She thought she would like to paint a sketch from Nature; so she got her sketch-book, paint-box, and camp-stool, and started out, very proud of herself, and quite sure she would succeed. She had not been taught anything about sketching, and did not know whether one subject was more difficult than another, so she chose a very pretty view, a blue sky, green fields, and waving trees. She painted very happily for a long time, then suddenly she felt her drawing was all wrong. She looked at the lovely country, and at her own drawing, then she tore it up. She went home very sad, and cried a little in her own room; but she was too proud to tell anyone, or to ask for help, because she was quite sure now that she would never be able to paint.


A green leaf and its shadow

Not long after this someone took her to a picture gallery, and she looked carefully at the pictures of landscapes painted by a man named Turner; and then suddenly her eyes were opened as if a fairy's wand had touched them. The trees looked all right in these pictures, yet she had always thought their trunks were black or grey; here they were all colours—green, yellow, red, even blue!

When she went into the country again she saw all these colours for herself, and found that green leaves sometimes looked white, or blue, or grey, according to the light or shade in which they were. And so she went to all the picture exhibitions she could find, and learned things that helped her wonderfully, and which she never forgot. The artists had shown her how to see things that they had learned to see. But it was rather silly of the girl not to ask older people for help as well, wasn't it? Perhaps she was wiser about this, too, as she grew older.


An open book painted on a green background

Shall we try to paint something now, and see what some of the difficulties are that we have to be helped over?

We will choose one of the things we have learned how to draw, and make the best drawing we can first, as no painting looks well unless the drawing is good too.

Shall we choose an open book—a bright brown one, and put it on a green background? We must draw it first carefully, taking care not to spoil the surface of the paper with rubbing out.

We know how to put on a flat wash, so we will do that first. If it is not quite smooth, it may be because we have not had enough practice. But perhaps the paper is not right. Water-colour paper, stretched as we know how to do it, is best; or we can use water-colour blocks. Perhaps the brush is not a good one; but good brushes and paints and paper will not make artists, though they help them very much. The best brushes are sable brushes, which want careful choosing. They are expensive, but they are nice for birthday presents, and we know by this time how to choose a brush, as painting soon teaches us the faults in our tools.

Then, perhaps, the colours seem chalky, especially ultramarine or cobalt, and leave little dark spots on the surface, however careful we are. Cobalt is very expensive if we buy it good; but it is better to have a very few colours, and to have the best, than to have a great many mixed paints of which we hardly use any, and now that we can paint a little it is worth while to get good paints. The best plan is to buy an empty enamelled tin box, and get the colours gradually as we can.

We must have light red and Indian red and rose madder. This last is better than crimson lake or carmine. We shall also want Vandyke brown and sepia, indigo, cobalt or ultramarine, yellow ochre, and lemon yellow. Everybody has a different list of colours that they like best, and it is nice to know the paints so well that we can make a selection that will be useful when we have spent still more time on painting.

We learned how to put one colour over another without spoiling it when we did the washes, so now we can put the shadow of the book over the background, softening the edges so that there is no hard line; and we can put the shadow on the white book and soften the edges in the same way. We must not put one colour on another till the underneath one is dry, and we must not work with the colour too dry in our brushes, or we shall get hard lines and edges where we do not want them.

Then we might try a leaf, putting the shadow it casts on the background before we colour the leaf itself. Shadows are made up of different colours; for instance, where the light shines through the leaf we see a greenish or yellowish tinge. If we try putting different coloured flowers on white paper, we shall see how different the colours even of shadows can be.

# LITTLE PICTURE-STORIES IN FRENCH

**First line: French. Second line: English words. Third line: As we say it in English.**

Il est huit heures. La chambre à coucher est noire. Nous sommes presque endormis.
*It is eight hours. The room to to sleep is black. We are nearly asleep.*
It is eight o'clock. The bedroom is dark. We are almost asleep.

Tout à coup il y a un bruit dans la cheminée. "Qui est là ?" dis-je.
*All at blow it there has a noise in the chimney. "Who is there ?" say I.*
Suddenly there is a noise in the chimney. "Who is that ?" I say.

On ne répond pas. La bonne entre ; elle frotte une allumette et allume le gaz.
*One (not) responds not. The nurse enters ; she rubs a match and lights the gas.*
There is no answer. Nurse comes in ; she strikes a match, and lights the gas.

Quelque chose dégringole dans la cheminée et tombe sur le plancher.
*Some thing tumbles down in the chimney and falls upon the floor.*
Something slides down the chimney and falls on the floor.

Jeannette crie. La bonne dit : "Chut ! Vous allez réveiller Bébé."
*Jenny cries. The nurse says : "Hush ! You go to awaken Baby."*
Jenny screams. Nurse says : "Hush ! You will waken Baby."

"C'est un petit chat," dis-je. "Il a peur. Puis-je lui donner du lait ?"
*"This is a little cat," say I. "He has fear. May I to him to give some milk ?"*
"It is a kitten," I say. "He is frightened. May I give him some milk ?"

La bonne tire la sonnette et la servante apporte du lait dans une soucoupe.
*The nurse pulls the bell and the servant brings some milk in a saucer.*
Nurse rings the bell, and the maid brings some milk in a saucer.

Bébé s'éveille et crie : "Joli minet ! Puis-je l'avoir dans mon lit ?"
*Baby herself awakes and cries : "Pretty pussy ! May I him to have in my bed ?"*
Baby wakes up and cries : "Pretty pussy ! May I have him in my bed ?"

Mais la bonne dit : "Nous le mettrons dans cette corbeille près du feu."
*But the nurse says : "We him will put in this basket near of the fire."*
But Nurse says : "We will put him in this basket near the fire."

Le matin il est parti. Peut-être les fées l'ont emporté.
*The morning he is departed. Perhaps the fairies him have carried away.*
In the morning he has gone. Perhaps the fairies have taken him away.

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 3707

# THUMBELINE FLOATED DOWN THE STREAM

Thumbeline became happy again, for everything she passed was so lovely in the sunshine, and the birds on the branches sang to her as she floated by with her pretty butterfly tied to the leaf of the water-lily with her sash.

# LITTLE TINY THUMBELINE

CONTINUED FROM 3314

Once upon a time there lived a young wife who longed to possess a little child, so she went to a fairy and said to her: " I wish very much to have a child, a little tiny child. Will you give me one, dear fairy ? "

" With all my heart," replied the fairy. " Sow this barleycorn in a flowerpot, and then see what will happen."

" Thank you, thank you ! " cried the woman, giving the fairy a silver coin. Then home she went, and planted the barleycorn, and immediately there shot up a large flower like a tulip, but with the petals tightly closed like a bud.

" What a lovely flower ! " said she, and kissed it. The bud opened at once with a loud voice, and there, in the centre of the flower, sat a little tiny girl about an inch high, scarcely bigger than her thumb. So she called her Thumbeline, and put her to bed in a walnut-shell, with violet-leaves for her mattress and a rose-leaf for a quilt. During the day she told Thumbeline stories, and taught her to sing, as she played on the table beside her.

But one night a great, wet, ugly toad came and stole away the cradle with little Thumbeline asleep in it, and carried it off to her home in the muddy bank of the brook that flowed past the end of the garden.

" This is just the wife for my son," thought she. But when her ugly son saw her, all he could say was " Croak, croak, croak ! "

" Don't make so much noise, or you'll wake her," said the old Mother Toad. " She may easily escape, for she is as light as a feather. We must take her out and place her on one of the large water-lily leaves in the middle of the brook, while I prepare our house for you both."

This they did, and when poor little Thumbeline awoke and found herself in the middle of the stream, she cried most bitterly.

As soon as old Mother Toad had decorated her home with bulrushes and yellow buttercups, she and her hideous son swam out to the leaf to fetch the cradle so as to place it in their new home before taking the little maid herself there.

Old Mother Toad bowed low in the water, and said: " Here is my son, who is going to be your husband. I will come and fetch you soon, and you will be very happy together."

Then they swam off with the cradle, and poor, terrified Thumbeline wept bitterly. Now, some little fishes had overheard old Mother Toad, and when they saw the little maid so sad they gnawed away the stem of the leaf, and away it floated down the stream, so fast that the toad could not catch it. Thumbeline became happy again, for everything she passed was so lovely in the sunshine, and the birds on the branches sang to her as she floated by. A pretty little butterfly hovered round her, and at last settled for a moment on the leaf, for he loved her very much. She was pleased, too, and tied him to the leaf with her sash.

But presently a great ugly cockchafer came buzzing past. He caught sight of her, and snatching her off the leaf, flew up with her into a tree; but the poor butterfly could not free himself, and went floating along downstream. The cockchafer gave Thumbeline some honey to eat, and praised her beauty; but when the henchafers saw her, they said that she was just like a human being.

"How very, very ugly she is!" they all cried; and at last the cockchafer disowned her, and they all flew down with her and set her on a daisy. Then she wept because she was so ugly that the henchafers would have nothing to do with her.

All the summer Thumbeline lived alone in a wood, dining off the honey from the flowers, and drinking the dew that every morning spangled the leaves around her. But then came the cold, long winter; the flowers all died, the birds flew away, and the snow began to fall. Poor hungry Thumbeline wandered through the stubble of a cornfield hard by until she came to the hole of a field-mouse, who dwelt snugly down in the ground, having a room full of corn, and a neat kitchen and store-room.

Thumbeline stood at the door and begged for food.

"Poor little thing!" said the good-natured field-mouse. "Come into my warm room and dine with me." And she soon became so fond of the tiny maid that she said: "You may dwell with me all the winter, if you will only keep my room clean and neat, and tell me stories, for I love stories dearly." And Thumbeline agreed, and was very happy in her new home.

In a few days' time the field-mouse said: "We shall have my next-door neighbour, the mole, in to visit us to-morrow; he comes to see me once a week. He is richer than I am, has large rooms in his house, and wears a beautiful black velvet coat. It would be capital if you married him; but he is blind, and cannot see you, so you must tell him your prettiest stories."

When he came, Thumbeline sang to him, and he soon fell in love with her. He invited them to walk down a long, dark passage that he had just burrowed from their house to his, lighting them with a piece of tinder.

But when they had gone a short distance they found a swallow lying stretched on the floor; the poor bird had evidently died of cold. Thumbeline felt very sorry, as she loved all the birds, but the mole kicked it with his short legs, saying:

"Here's a fine end to all its whistling! What a miserable thing it must be to be born a bird! None of my children will be birds, thank goodness!"

But Thumbeline could not sleep that night, so she got up, and wove a carpet out of hay and then went and spread it round the bird; she also covered it with some warm, soft cotton.

"Farewell, dear bird," said she; "farewell, and thank you for your beautiful song in the summer, when all the trees were green and the sun shone so warmly upon us." And she pressed her head against his big body. To her great surprise she felt something beating within it. It was the bird's heart, and he was not really dead. She quickly laid the cotton more closely round him, and he gradually revived.

He remained underground all the winter, and Thumbeline was kind to him and brought him water and food; but she never said a word either to the mole or the field-mouse.

As soon as the spring came the swallow said farewell to Thumbeline, who would not go with him, because she knew it would vex the old field-mouse if she left her.

Thumbeline was now sad indeed, for she was not allowed to go into the warm sunshine.

"This summer you must work and make your wedding clothes," said the field-mouse, for the blind, dull mole had decided to marry Thumbeline.

So the tiny maid was obliged to work hard at the distaff, and the field-mouse hired four spiders to spin and weave.

Every evening the mole came and talked about how the summer was coming to an end, and he abused the sun and pretty flowers so much that Thumbeline disliked him more and more, and said she would not marry him.

"Fiddlestick!" cried the field-mouse. "Don't be obstinate, child, or I will bite you with my white teeth."

At last the day fixed had arrived, and Thumbeline went to bid a last farewell to the beautiful sun before going to dwell with the mole deep down in the earth.

"Farewell, thou glorious sun!" she cried, as she walked a little way.

"Tweet, tweet!" And she heard a fluttering of wings, and there was the little swallow. She told him her sad fate and how she longed to be free.

"The cold winter will soon be here," said the swallow; "I shall fly far away to the warm countries. Come with me, sweet little Thumbeline, who didst save my life when I lay frozen in the dark earth."

"Yes, I will go with thee," said she; and she seated herself on the bird's back, and then the swallow soared high into the air and flew away over forest, lake, and mountain, until they reached the warm countries. There the sky seemed twice as high and twice as blue, and there grew the loveliest green and purple grapes, and citrons, and melons.

Near a calm, blue lake stood a half-ruined palace of white marble, and here the swallow had built his nest.

"This is my house," said the swallow, "but I will take you to one of the splendid flowers growing beneath us, and you shall dwell in one of them."

But what was her surprise when she saw sitting on the flower a little mannikin wearing a gold crown on his head and the brightest, most delicate wings on his shoulders, scarcely any bigger than herself. He was the spirit of the flower, and in every flower there dwelt one such fairy, and he was their king.

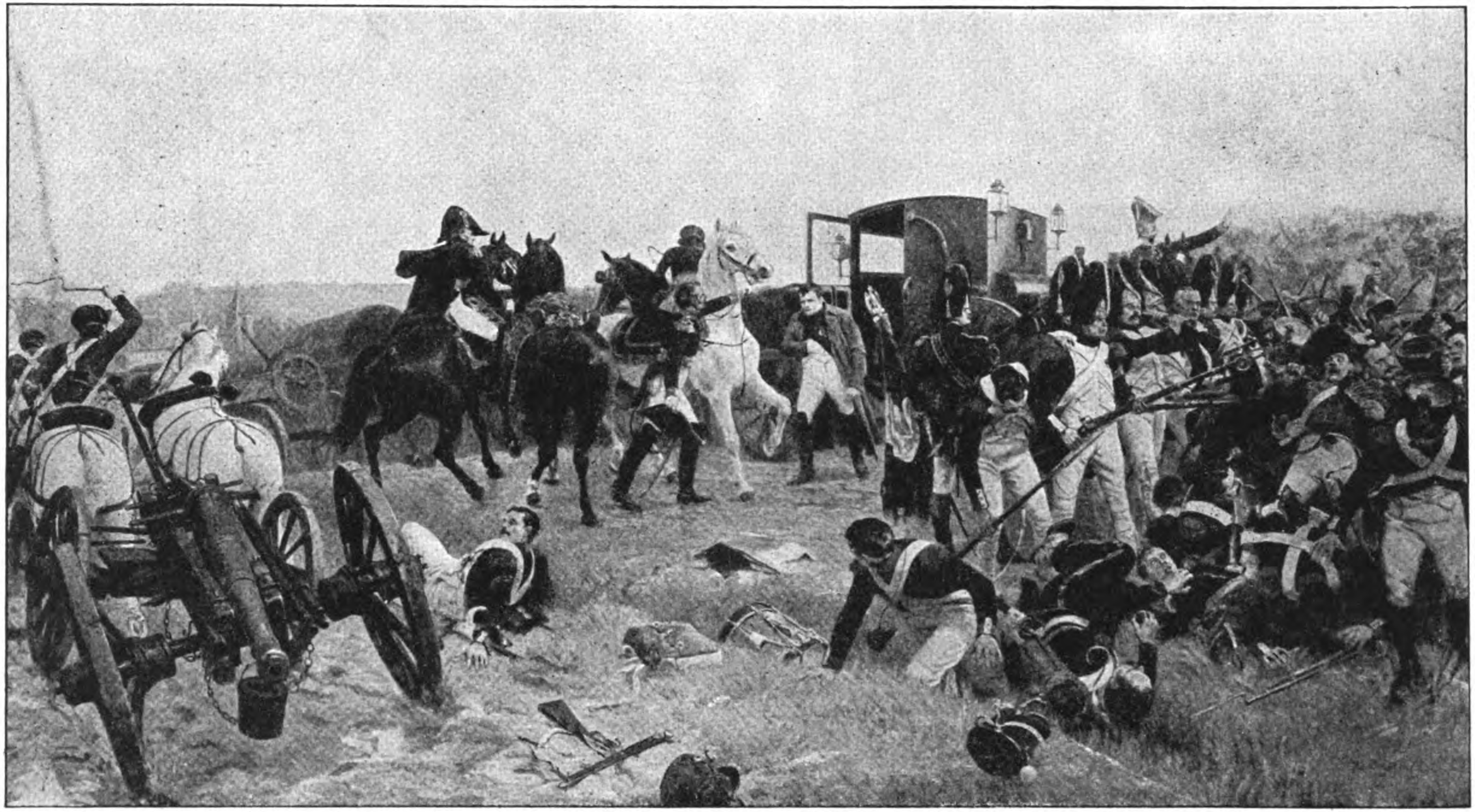
ALL THE FAIRIES CAME OUT FROM THEIR FLOWERS AND BROUGHT THUMBELINE PRESENTS

When he saw Thumbeline he was delighted, for he had never seen so lovely a maiden. So he put his gold crown on her head and asked her to be his queen. And Thumbeline said "Yes," and then all the fairies came out from their flowers and brought her presents, and the best of all was a pair of transparent wings, which enabled her to fly from flower to flower.

"You shall no longer be called Thumbeline," said the king to her, "for it is not a pretty name, and you are so lovely. We will call you Maia."

And she dwelt with him ever after.

# NAPOLEON FLIES FROM HIS FIELD OF DOOM, TO CARRY THE NEWS OF HIS FALL TO PARIS



After the defeat of his army and the ruin of all his hopes at Waterloo, Napoleon fled from the battlefield in a carriage. But the Prussians were following so closely that Napoleon had to leave his carriage for a horse, and scarcely had he quitted his seat when the vehicle with its horses fell into the hands of the pursuers. In his haste he left his hat in the carriage.

This striking picture of a great scene in history is from the painting by Mr. Ernest Crofts, R.A., which now hangs in the Walker Art Gallery, Liverpool.

# HOW NAPOLEON RODE FROM WATERLOO

The story is told that, at one moment during the battle of Waterloo, while the Duke of Wellington rode in front of his brave soldiers at Waterloo, saying, "Stand firm, my lads!" or "Hard pounding this, gentlemen; we will see who can pound the longest!" on the opposite side of the terrible battle-field Napoleon sat at a table, his feet buried in straw, his arms resting on the papers before him, his head nodding, his eyes heavy.

What a tragic figure! The great emperor, the terror of the world, in the midst of a frightful battle which would decide the fate of Europe—stunned with ruin, crushed by the certainty of doom. Can you think of anything more strange and sad?

Think of the huge cannons roaring in a great circle of fire and smoke; think of squadrons of horsemen thundering across the plain with sabres raised and shouting their battle-cries; think of long lines of foot-soldiers standing steadfast behind their bayonets, while behind them and over their shoulders the second lines fire, and fire again, at the approaching enemy! Think of the clamour, the noise of cannon and musket, the shouting of men, the screaming of horses, and the thud of galloping hoofs. Think of the movement—the rush of cavalry, the wheeling double of infantry, the terrific shock when two bodies of troops clashed together in hand-to-hand fight! Think of all these things! And then picture with your mind's eye a map-strewn table in the open air, and at that table the Terror of Europe in his grey coat and his long riding-boots, with nodding head and heavy eyes, stunned by ruin.

And when at last he saw that the battle was lost, it was not with haggard, staring eyes of terror that he raised himself to see the truth, but still with dazed and clouded eyes like a man in a stupor. That wonderful flicker of his mind which we read about at Elba had lasted a hundred days. It was quenched at Waterloo. From that moment the great Napoleon was the meanest of men. He stepped off the field of Waterloo into the carriage that was waiting for him. And all about him the torn and bleeding remnants of his shattered army were flying from the enemy. Bodies of galloping horsemen, bodies of running infantry, bodies of sweating artillery toiling at their cannons; a multitude of human wreckage, gasping, stumbling, and groaning, the torn and shredded banners staggering in the air, the knotted bandages round the heads of bearded warriors showing white against the steel-coloured sky—a great host stricken by a panic and rushing in a mad disorder from the roar of death.

Napoleon saw all this through his dazed and clouded eyes.

"Isn't your Majesty surprised?" someone is said to have asked Napoleon.

"No," was the answer. "Since the days of Cressy it has been ever thus."

At Genappe, the Prussians were following so closely that he left his carriage for a horse, and in so doing, it is said, he had to defend himself with his pistols. Scarcely had he quitted his seat when the vehicle with its horses fell into the hands of the pursuers, and so great was this fallen man's haste to get away, that he left in his carriage his hat and sword.

"What shall I do?" he asked, as they rode through the night.

"Ride to Paris," was the answer.

So he rode on, outstripping his army, struggling to rouse the shattered power of his once mighty intellect, beating his brain to tell him how to save his throne.

At four o'clock in the morning he reached Paris, and went to his palace. All he could do when he arrived there was to tramp up and down the big, gilded chambers, exclaiming, "Oh, my God! Oh, my God!"

He was beaten. Judgment had fallen upon him. Twice before, he had returned to Paris with a defeated army. This was the third time, and Paris could forgive no longer. France threw off Napoleon for the last time. They gave him an hour! Think of it! He who had given them an empire, he who had received from them a throne, was given an hour to decide his fate!

He surrendered his throne. For a few weeks he waited in Paris, hoping his soldiers would call him back, and then he rode out of Paris for the last time and gave himself up to a British ship.

# LITTLE IDA'S FLOWERS

"My poor flowers are quite faded," said little Ida. "Only yesterday evening they were so pretty, and now they are all drooping! What can be the reason of it?" asked she of the student who was sitting on the sofa beside her.

"Do you not know?" replied the student. "Your flowers went to a ball last night, and are tired, that is why they all hang their heads."

"Surely flowers cannot dance!" exclaimed little Ida.

"Of course they can dance! When it is dark, and we are all gone to bed, they jump about as merrily as possible. They have a ball almost every night."

"May their children go to the ball, too?" asked Ida.

"Yes," said the student, "little daisies and lilies of the valley."

"And where do the prettiest flowers dance?"

"Have you never been in the large garden in front of the king's beautiful summer palace, the garden so full of flowers? Surely you recollect the swans which come swimming up to you when you throw them crumbs of bread? There, you may imagine, they have splendid balls."

"I was there yesterday with my mother," said Ida, "but there were no leaves on the trees, neither did I see a single flower. What could have become of them? There were so many in the summer-time!"

"They are now at the palace," answered the student. "As soon as the king leaves his summer residence, and returns with all his court to the town, the flowers likewise hasten out of the garden and into the palace, where they enjoy themselves famously. Oh, if you could but see them! The two loveliest roses sit on the throne, and act king and queen. The red cockscombs then arrange themselves in rows before them, bowing very low; they are the gentlemen of the bed-chamber. After that the prettiest among the flowers come in, and open the ball. The blue violets represent midshipmen, and begin dancing with the hyacinths and crocuses, who take the part of young ladies. The tulips and the tall orange-lilies are old dowagers, whose business it is to see that everything goes on with the most perfect propriety."

"That is very funny," said Ida, clapping her little hands; "but could not I see the flowers?"

"To be sure you can see them!" returned the student. "You have only to peep in at the window next time you go to the palace."

Little Ida thought what the student had told her about the flowers was very droll, and she could not leave off thinking of it. She was now sure that her flowers hung their heads because they were tired with dancing so much the night before. So she took them to the pretty little table where her playthings were arranged. Her doll lay sleeping in the cradle, but Ida said to her: "You must get up, Sophy, and be content to sleep to-night in the table-drawer, for the poor flowers are ill, and must sleep in your bed, perhaps they will be well again by to-morrow."

Ida then laid the faded flowers in her doll's bed, drew the covering over them, and told them to lie quite still.

All the evening she thought of nothing but the student's words, and just before she went to bed she ran up to the window where her mother's tulips and hyacinths stood behind the blinds, and whispered to them: "I know very well that you are going to a ball to-night." But the flowers moved not a leaf, and seemed not to have heard her.

After she was in bed, she thought for a long time how delightful it must be to see the flowers dancing in the palace. Soon she fell asleep, but during the night she awoke; she had been dreaming of the student and the flowers. All was still in the room, the night-lamp was burning on the table, and her father and mother were both asleep.

"I wonder whether my flowers are still lying in Sophy's bed?" said she. "I should very much like to know." She raised herself a little, and, looking towards the open door, she saw that the flowers and all her playthings were just as she had left them. She listened, and it seemed to her as if someone must be playing low, sweet music on the harpsichord somewhere quiet near.

"My flowers must certainly be dancing," said she. "Oh, how I should like to see them!" But she dared not get up for fear of waking her father and mother. At last she could restrain herself no longer, so she crept lightly out of bed, and stole towards the door of the room. Oh, what wonderful things she saw!

There was no night-lamp burning here; it was quite light in the room, for the moon shone brightly through the windows on the floor. All the hyacinths and tulips stood there in two rows, while their empty pots might still be seen in front of the windows; they performed figures, and took hold of each other by the long green leaves. At the harpsichord sat a large yellow lily, bowing her long yellow face now on one side, now on the other, and nodding her head to mark the time. A tall blue crocus now stepped forward, sprang upon the table on which lay Ida's playthings, went straight up to the bed, and drew back the curtains. There lay the sick flowers, but they rose immediately, and greeted the other flowers, who invited them to dance with them. The sick flowers appeared to be quite well again, and danced as merrily and happily as the rest. Suddenly, a heavy noise was heard, and Ida saw that it was the rod which she had found on her bed on the morning of Shrove Tuesday. It was certainly a very pretty rod, for a wax doll was fixed on the top, wearing a broad-brimmed hat, with a blue and red ribbon tied round it. It hopped upon its three red stilts in the middle of the flowers, and stamped the floor with its feet. It was dancing the mazurka, which the flowers could not dance; they were too light-footed to stamp. A loud knocking was now heard from the drawer in which lay Ida's doll. It was Sophy who made the noise. She put her head out of the drawer and asked in great astonishment:

"The two loveliest roses sit on the throne and act king and queen, and all the prettiest flowers come in and open the ball," continued the student. "That is very funny," said Ida, clapping her little hands.

"Is there a ball here? Why has no one told me of it?"

"Will you dance with me?" asked the nut-crackers.

"Certainly you are not a very fit person to dance with me!" said Sophy, turning her back upon him. She then sat down on the table, expecting that one of the flowers would come and ask her to dance, but, as no one came, she suddenly let herself fall down upon the floor, which excited a general commotion, so that all the flowers ran up to ask her whether she had hurt herself. They were all very polite, especially Ida's flowers, who thanked her for the comfortable bed in which they had slept so quietly, and then seized her hands to dance with her, while all the other flowers stood in a circle round them. Sophy was now quite happy.

Sophy, Ida's doll, put her head out of the drawer in which she lay, and asked in great astonishment: "Is there a ball here? Why has no one told me of it?" "Will you dance with me?" asked the nut-crackers.

Just then the door was suddenly opened, and a number of flowers danced into the room. Ida could not conceive where these flowers came from, unless from the king's garden. First of all entered two beautiful roses wearing golden crowns, then followed stocks and pinks, bowing to the company on all sides. They had also a band of music with them; great poppies and peonies blew upon pea-shells till they were quite red in the face, while blue and white campanulas rang a merry peal of bells. These were followed by an immense number of different flowers, all dancing—violets, daisies, lilies of the valley, narcissi, and others, who all moved so gracefully that it was delightful to see them.

At last these happy flowers wished one another "good-night"; so little Ida once more crept into bed to dream of the beautiful things she had seen.

The next morning, as soon as she was up and dressed, she went to her little table to see if her flowers were there. Yes, there lay the flowers, but they were much more faded than yesterday. Sophy, too, was lying in the drawer, but she looked very sleepy.

"Can you not remember what you have to say to me?" asked little Ida of her; but Sophy made a most stupid face, and answered not a syllable.

"You are not at all good!" said Ida; "and yet all the flowers let you dance with them." She then chose out from her playthings a little pasteboard box with birds painted on it, and therein she placed the faded flowers. "That shall be your coffin," said she, "and when my cousins come we will bury you in the garden, in order that next summer you may bloom again, and be still more beautiful than you were this year."

# THE FABLES OF ÆSOP THE SLAVE

## THE GOAT AND THE LION

A LION one day saw a goat upon a steep, craggy rock, where he could not climb up to him, so he said: "What pleasure can you possibly find in jumping from one rock to another all day, and risking your neck every moment? I wonder that you do not come down here and feed in the meadow, where there is plenty of fresh, sweet grass."

"Well," replied the goat, "what you say may be very true; but, to tell you the truth, you look so uncommonly hungry and fierce that I do not care to take the risk and venture too near you."

*Beware of the advice of people who want to gain something from you.*

## THE CROW AND THE PITCHER

A CROW, almost dying with thirst, found a pitcher, or tall jug, which had a little water in the bottom. Unfortunately, the crow was not able to reach the water. Again and again he tried, but without success. Then he tried to knock the pitcher over, so that he might get at the water; but he was not strong enough for this.

At last he noticed a quantity of little pebbles lying about. After much trouble and labour he gathered these together, and, dropping them into the pitcher one by one, he at last raised the water up to the brim, and so was able to drink.

*Where there's a will there's a way.*

## THE TWO FROGS

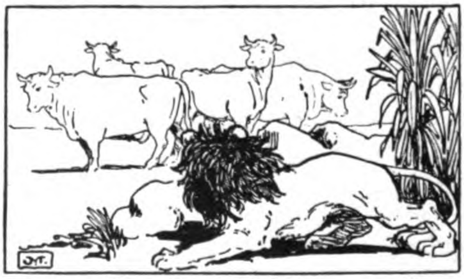
ONE hot summer, when the country was parched and the lakes and ponds had nearly all dried up, two frogs were travelling together in search of water. At last they came to a deep well, and, sitting upon the edge of it, began to discuss whether they should jump in. One of them was in favour of doing so, urging that there was plenty of clear water and no danger of being disturbed; but the other thought for some time, and then answered: "That is all very well; but I do not care to jump in, because if the water should happen to dry up here, how shall we get out again?"

*Always look before you leap.*

## THE LION AND THE FOUR BULLS

FOUR bulls who were great friends always kept near one another and fed together. A lion had often watched them, and wanted to kill one for his dinner. But he was afraid to attack all four together, knowing that they would defend one another. So he began by telling one of the bulls stories about the others to arouse jealousy and bad feeling among them.

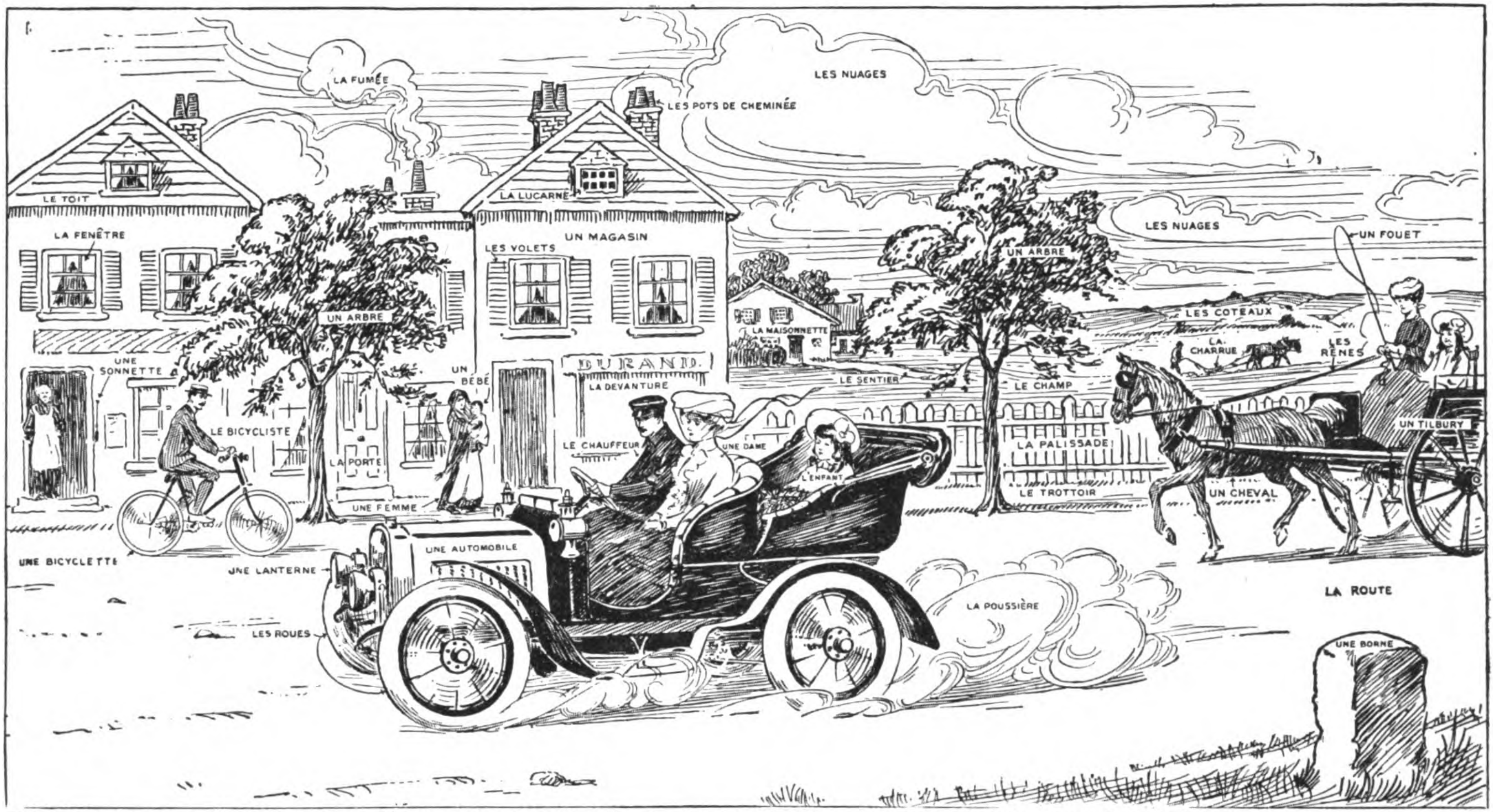
The result was that the four bulls quarrelled and no longer went about in company. They separated and roamed alone. Then the artful lion was able to kill and devour the bulls one at a time.



*Remember that union is strength.*

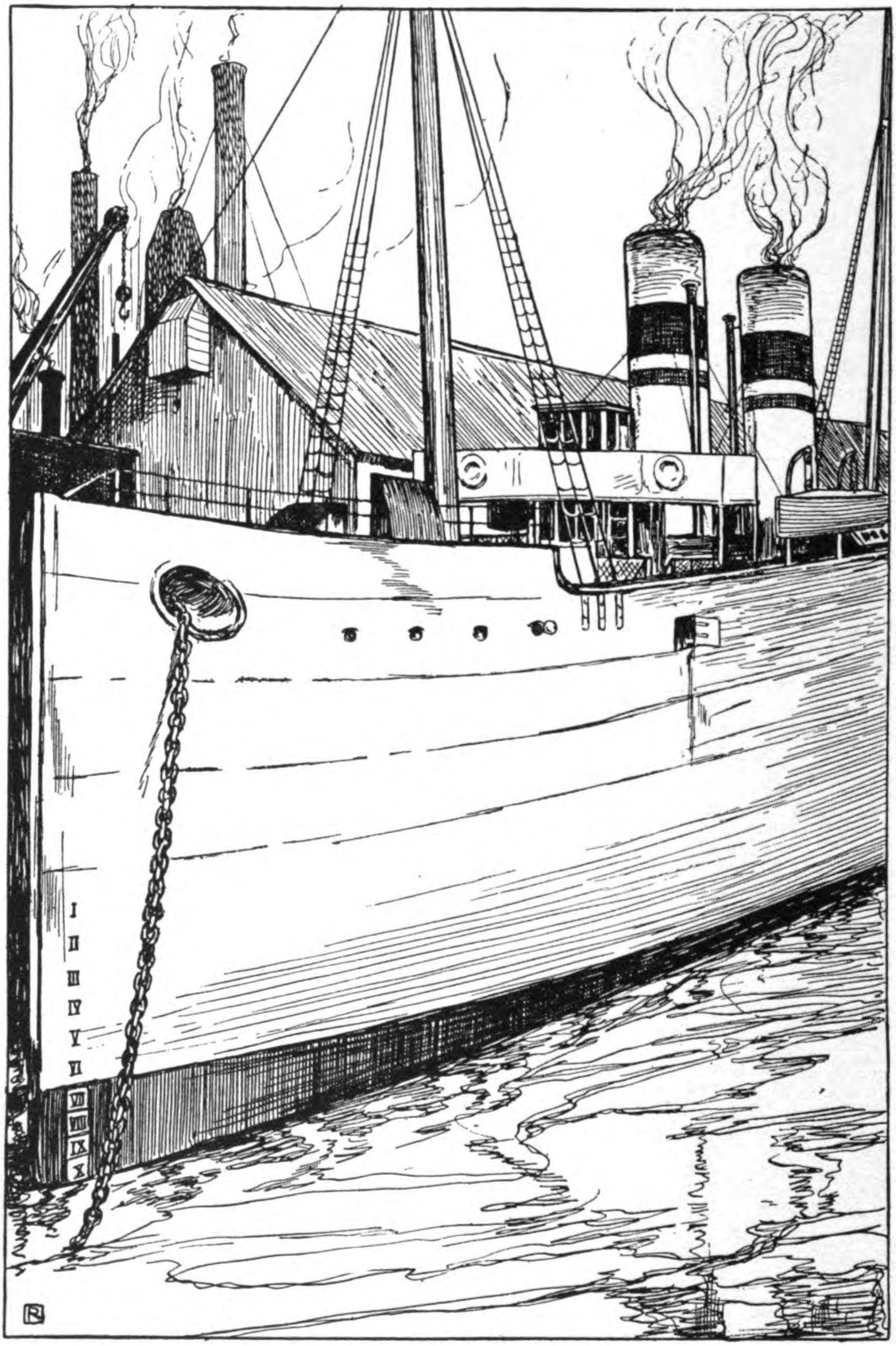
THE NEXT STORIES ARE ON PAGE 3575

# A FRENCH LESSON IN PICTURE: THE NAMES OF FAMILIAR OBJECTS IN THE COUNTRY



This picture teaches us the French names of familiar things in country life. Reading from the left we have the roof, window, and bell of a little house, and a cyclist is passing on a bicycle. A shop with its chimney-pots and their smoke, its shutters, door, plate-glass window, and the owner's name, Durand—as familiar in France as our Smith or Jones—is a background to a woman and her baby and an automobile, with its chauffeur, lady and child, wheels, lantern, and dust. To the right are the pathway, palings, tree, and the footpath leading to the cottage. Then comes a horse pulling a gig, with reins and whip, along the road past a milestone. Beyond, we see the plough in the field, and hills, clouds, and sky above.

# WHAT IS WRONG WITH THIS STEAMER?



**When we visit the docks or stand on a busy wharf at a large seaside town, we often gaze at the great ships that bring us the wheat and the timber and all the wealth of the world for use in all parts of the country. Here is a picture of one of these great steamers, and in making his drawing the artist has made at least ten mistakes. Can we find out where he is wrong? We can compare our list with that given on page 3616 of this book.**

# HOW TO PRESERVE REAL FLOWERS

CONTINUED FROM 3398

When we look at all the gay flowers in the garden during the summer, we feel sorry that they will last only such a short time. A clever German has discovered a way by means of which real flowers may be preserved in their natural colours, and these will last a good many months without fading. It is not very difficult to deal with flowers in this way, and if the directions are carefully followed one is almost certain to meet with success.

In order to preserve the flowers a large and rather shallow box should be obtained. We shall not want the lid, and even the bottom must be knocked out, so that we have a kind of frame. Across the inside of the frame, nail a piece of wire netting with the mesh about the same as that used for rabbit-hutches. This is fixed in its place instead of the bottom of the box in order to give a support to the flowers, which we shall put in presently, and yet to allow the air, which will dry the blossoms, to come freely through. We next get a board which is quite flat and large enough for the frame to stand on, leaving a little space all round. The only thing that is now required is a quantity of silver sand, and this can be bought at any stores.

When we get the sand it will have a lot of dirt mixed with it however clean it may look, and this must be removed. The best way to get rid of the dirt is to put some of the sand into a large pie-dish, and then pour some water on to it. A great deal of the dirt will float upon the surface of the water, and if the liquid is poured away many of the bits will go also. But we shall have to repeat this process several times with each lot of sand until it is quite clean; the best way to judge as to whether it is ready or not is to take a little in the palm of the hand, and see whether we can find any black pieces amongst the white mineral grains. When all the sand has been washed in this way, it should be spread out on a tray and allowed to become perfectly dry. Great care must be taken that it does not get dirty again. The time has now come when the flowers may be gathered in the garden. Some kinds are much more easily preserved than others, and it will be found that roses, asters, and chrysanthemums are especially good. In a general way white flowers are not so successful, as the petals are apt to turn rather a dirty yellow in colour. Pinks and crimsons are perhaps the best colours of all, though one cannot well discover those which will answer the purpose without trying them. The flowers must be quite dry and free from rain or dew, and as perfect as possible.

We place the frame on its stand of wood with the wire netting downwards. First of all we put a thin layer of the clean sand inside, and after this place the flowers on the wire netting, spreading the petals with our fingers. It is now time to cover in the flowers with a layer of sand, and this should be put on very evenly. In the case of some flowers it is a good plan to turn the heads upwards before covering in with sand. Supposing the flower is bell-shaped, such as a tulip, the inside must be filled with the sand. When the flowers are quite covered in, if the box should be deep enough, one more lot of blooms may be arranged. As a rule, it is not a good plan to have more than two layers of flowers in each box.

The frame containing the drying flowers may now be removed, and it should be placed in a warm, dry place. Of course, the bottom part must be taken with it, or all the sand will fall out. A good position for the frame is on a shelf in a sunny greenhouse, where the drying process can go on quickly; or, failing this, somewhere in the kitchen. After about ten days we may take a peep at our flowers by just pushing away a little of the sand; if the blossoms feel crisp and dry the time has come to take them out. Supposing, however, that they are still moist, they must be left in the sand a little longer. When the specimens are quite finished they may be taken out from the frame, care being exercised in handling them, as at this stage the petals are very brittle. It will be found that the blooms are nicely preserved, and in such a condition that they will last without any water being put into the vase or bowl which contains them.

# HOW TO MAKE SWEETS AT HOME

We are all fond of candy, but perhaps some of us have never tried to make our own. Many kinds of candy are so simple to make, and give such little trouble, that we may like to try some of these recipes.

### BURNT ALMONDS

Dissolve 1 lb. of light brown sugar in a teacupful of water, and stir this in a pan over the fire until it comes to the boil. Cease stirring for two or three minutes; then add ½ lb. of blanched almonds, and stir quickly until the sugar browns and coats them. Turn them on to a wire sieve to cool, dividing any that may have become joined together.

### PEPPERMINT CREAMS

Mix in a basin 3 ozs. of arrowroot with three gills of cold water until smooth. Put this into a lined saucepan with 1 lb. of white sifted sugar, and keep stirring it. Let it boil for ten minutes ; then move the saucepan off the fire, but stir the contents till cool. Flavour with a few drops of peppermint essence. Take up lumps of the mixture, roll them into little balls, and put them on a slab of marble that has been buttered slightly to prevent sticking. When cold, roll the creams in icing sugar. These candies are also made by flavouring fondant mixture with peppermint.

### CREAM FONDANTS

Put into a pan on the fire 2 lb. of granulated sugar, and pour on to it a small teacupful of hot water. Allow this to boil about eight minutes, or till it thickens, but on no account stir it. To test it, take up a little on a new wooden skewer. If a thread forms on taking a drop between the thumb and first finger and separating them, pour the mixture into a bowl and, while warm, beat it with a wooden spoon till creamy. As it cools flavour it with vanilla, raspberry, or some other essence, and colour half of it pink with cochineal. The candy is then ready.

### CHOCOLATE CREAMS

Take some of the fondant mixture and roll it into balls with the hands. Place the balls on a sheet of oiled paper and leave it for twenty-four hours. Cut up about a quarter of a pound of some unsweetened chocolate and soften it in a pan standing in another one of boiling water. Add to the chocolate two tablespoonfuls of water and 2 ozs. of icing sugar, and stir it smooth. A tiny lump of butter and a few drops of cream improve the chocolate. Drop the fondant balls into it, get them out with the aid of a fork, and lay them on paper to cool and dry.

### COCOA-NUT BALLS

Put into a pan and boil, unstirred, ½ lb. of white sugar and three-quarters of a small teacupful of water until a few drops crackle when dropped into cold water from the end of a wooden skewer. Now stir in 1 oz. of desiccated cocoa-nut. Take lumps of the mixture and roll them into little balls.

### BARLEY SUGAR

Put into a pan and boil 1 lb. of loaf sugar, a small teacupful and a half of water, and a tiny pinch of cream of tartar. Test it by dipping in a wooden skewer and plunging this in cold water. If the sugar is brittle, it is ready for the addition of the juice of a quarter of a lemon and a little saffron colouring. Let it boil to 300° F. by the thermometer, pour it on to a sweet-oiled marble slab, and cut it into strips with scissors. Twist these and store them in glass bottles.

### VANILLA CARAMELS

Boil over the fire in an aluminium or tin-lined saucepan, stirring frequently, 1 lb. of loaf sugar, three dessert-spoonfuls of glucose, and a small teacupful of water. Test it by dropping a little into cold water. If it hardens, add one gill of cream and ½ oz. of butter. Boil again, stirring frequently, till a little turns brittle on being dropped into cold water ; then flavour with vanilla essence and pour the caramel on to a tin or oiled marble slab. Cut it into convenient squares and wrap them neatly in oiled paper.

### NOUGAT

Blanch and chop coarse ½ lb. of almonds and dry them in the oven. Put ¾ lb. of castor sugar with one dessert-spoonful of lemon-juice into a pan, and stir it with a wooden spoon till it colours slightly. Drop in the almonds. Pour the nougat on to a marble slab, press it into cubes or mark it in squares with a knife dipped in hot water, and break them up when cold.

### TURKISH DELIGHT

Melt 1 oz. of gelatine in a teacupful of cold water, and put this into a saucepan with 1 lb. of fine sugar and the juice of an orange and a lemon. Boil it up three times and then simmer it about twenty minutes till sticky. Butter a soup-plate and pour half the mixture into it. Colour the remainder with a few drops of cochineal, pour it on to the rest, and set it to stiffen. Then warm the plate slightly to loosen it, turn it on to paper dusted with icing sugar, cut it into squares, and sugar these also. Store it in a tin.

### MARZIPAN POTATOES

Prepare some marzipan as described in making Easter eggs, on page 2975, or mix half a pound each of castor sugar and ground almonds with the white of one egg, beaten stiff and flavoured with essence of almonds. Shape pieces into the form of new potatoes, punching dents for the "eyes" with a skewer. Roll the potatoes in cocoa essence in order to coat them brown.

### MARZIPAN FRUITS AND NUTS

Strawberries, cherries, mushrooms, dates, and walnuts can be made with marzipan. The hulls of the strawberries are cut out of green crinkled paper, the stalks of the cherries of twists of paper or green-covered wire. The marzipan is shaped and rolled in sugar coloured with cochineal and placed on paper to harden.

Real fruit may be halved and marzipan placed between the halves.

A mushroom is shaped by flattening a lump of marzipan in the hand and hollowing a centre for the stalk. Dust the under side with cocoa essence. Roll some marzipan for the stalk, and dip one end in white of egg to make it stick in the hole. If the white part looks too yellow, moisten the surface with white of egg and dust it with sifted sugar.

A flattened lump of marzipan can be inserted between the two halves of a dried walnut or replace the stone of a date.

Acorns in cups and numbers of delicious bonbons can be devised out of marzipan.

### MARSH MALLOWS

Dissolve 2 ozs. of gum arabic in one gill of cold water. Warm and strain it into a pan over a fire, with 4 ozs. of icing sugar, stirring constantly till a little forms a ball when dropped into cold water. Remove the pan, add one and a half whites of eggs previously beaten stiff. Flavour with caramel essence. Stir and turn mixture on to a tin sprinkled with icing sugar to set for twelve hours. Cut into cubes and dust these with icing sugar.

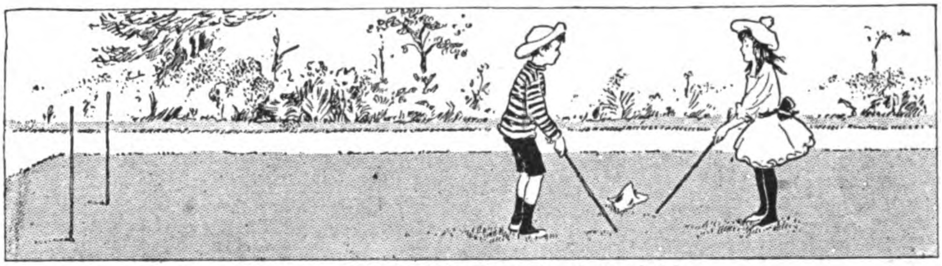
# THE GAME OF STICKERCHIEF

A SPLENDID game that can be played by any number of children is "Stickerchief." It is quite as exciting as hockey or lawn-tennis, and it has the advantage of not requiring expensive balls, racquets, or sticks.

Stickerchief is played with a handkerchief and some short pieces of bamboo, of the sort used by gardeners to hold up tall flowers. A dozen of these bamboos can be bought at any florist's for one shilling.

The game can be played on a lawn of any size, and the grass will not be injured, as it is not necessary to make any white lines on it. We have only to make two goals, one at each end of the lawn, and these will merely be formed by the flower-sticks stuck into the grass about four feet apart. When we have placed two sticks at each end of the lawn in this way we can begin.

It is best to make the first attempt with only two players. Each must have one of the light bamboo sticks, and they must stand in the centre of the lawn between the two goals. Now they must place a handkerchief on the ground, and stand on opposite sides of it with the ends of the sticks just touching the ground, about a foot away from the handkerchief, as we see in the picture.


The game of stickerchief as played by a boy and girl

Then one player must count "One—two—three—go!" and at the word "Go" both must try to pick up the handkerchief on the sticks. This is much more difficult than it looks. Each player tries to knock his opponent's stick away.

Presently one manages to pick up the handkerchief, and then runs as fast as he can towards the opponent's goal. Of course, the other player follows, and tries to get the handkerchief off the stick. If he manages to get it on to his own stick he rushes with it to the other goal.

In a few minutes both players become tremendously excited, for often they get within a few feet of the goal before they drop the handkerchief. Then they have a fine struggle for it. Sometimes the handkerchief flies off the stick while the player is running with it, and then the other player can often catch it before it reaches the ground. Sometimes it is skilfully knocked off, and sometimes neatly lifted off Any way is considered fair; the game is simply to get the handkerchief through the opponent's goal and to prevent him from scoring. A game is finished when a goal is scored. A match consists of five games, and the player who wins the larger number of games is the victor.

After a little practice any number of children can play together. Two captains are chosen, and these captains pick the players who are to form the teams. Four, six, or even ten players may be in each team; in fact, the only limit is the size of the lawn.

When all are ready, and have been provided with the sticks, the captains tell the players where they are to stand—some close to the goal, and others near the middle of the lawn. Then the captains take their places by the handkerchief, and start the game at the word "Go." Of course, it becomes ever so much more exciting when a number are playing, and often it is quite a long time before either side can score a goal.

If there are many players on each side they ought to be distinguished in some way, so that they can be recognised at once as friends or foes. It is a good plan to tie little bows of ribbon in the middle of each stick. One side can have green bows and the other red. These look pretty, and are far more easily seen than colours worn on the sleeve.

The game is a splendid one for a children's party, as boys and girls can play together. It has all the fascination and excitement of hockey, without the danger of bruises that are too often caused by hard balls and heavy sticks. The light bamboos used for "Stickerchief" cannot hurt anybody.

# A LITTLE VEGETABLE GARDEN

## WHAT TO DO IN THE MIDDLE OF JUNE

There is time now to look round and enjoy the sight of the rapid growth of all that we have planted. Yet we may not be idle. The tomatoes that we planted in the warmest corner we could find will need careful watering, and it is not enough to pinch out the side shoots once or twice: we must go on pinching them out as they appear.

The stems of the potatoes have grown considerably since we made our first earthing-up of the soil around them, so we may now earth-up higher than was possible at first.

If the soil be very dry where the peas are growing we must water them frequently, or put a top dressing of stable manure over the surface of the soil round about them. A top dressing of littery manure both in the flower garden and in the vegetable garden is often used. It is best applied after rain while the soil is moist; in this state the top dressing will prove a valuable means of keeping the moisture in the soil and preventing evaporation when the sun is hot upon it. Another means is to use the hoe frequently, and we have already learned how this was effectual—the moisture is lost more quickly when the tiny atoms of soil lie close together than when they are loose.

We must remember that it is not well to pull our rhubarb too closely; for each stem pulled the plant loses a great leaf, and if too many be pulled the loss is felt unduly. Now that gooseberries are in season for cooking, we should give our rhubarb a little rest, or, at any rate, pull sparingly for a time; later on, in a month or less, according to the weather, we may begin to pull again, for a juicy second crop of young stems will have grown up. Many people prefer to wait for this second crop before making rhubarb jam.

As the lettuces, or, in fact, any crops, become ready for use, make no long tarrying before beginning to use them. To wait till the whole crop becomes ready to be eaten is a fatal mistake. Rather begin to pull too soon than too late. It is a well-known fact that the more peas we pick the more we shall be able to pick, for if we relieve the plants of the many pods they bear as soon as these pods are ready for use, the plant has sufficient strength immediately to produce fresh pods. With other crops—lettuces, for instance—if we do not begin to use them as soon as we should, some of the plants will run away to seed before we can eat them.

The first crop of Lima beans should be planted by this time with another sowing later.

If we have some raspberry-canes, it is a good thing to put a top dressing over the soil in which they are growing. This dressing may consist of littery stable manure, but if this is not to be obtained, use a sprinkling of the mown grass, or some half-decayed leaf mould; the main thing is to give the canes all the moisture that is in the soil, and therefore, by this top dressing, to prevent evaporation.

In the flower garden we have now all our summer plants in their places, and if everything is not as neat and trim as it can possibly be made, no time should be lost in putting it in order. Perhaps we have plants that we have been growing in pots—our fuchsias and geraniums and others. These may well be planted out for the summer. The geraniums should have the sunniest place we can find, and it is better not to water them very frequently if we want plenty of blossom. Abundance of moisture will give us large plants with large leaves, but very few flowers. The geranium has a great deal of moisture in itself; the green stems are soft and juicy, and such plants are better kept rather dry. They go to England from South Africa, and are able to bear very hot sunshine and dry weather.

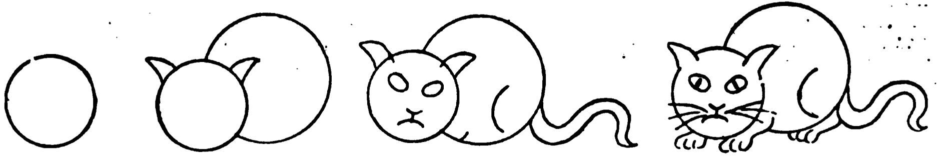
If we have a greenhouse, we have probably that beautiful rose, Maréchal Niel, in it. It flowers under glass earlier than roses grown out of doors, and needs pruning at a different time—when it has finished flowering.

If we have the care of a greenhouse as well as of a little garden, we are bound to think of how we are to stock it. Now is the time to sow cineraria seed. The best way is to sow the seed in pots or pans, which should be kept covered with a piece of glass until the seedlings appear. We must stake our dahlias and other plants as soon as they need it. The stakes must be planted firmly in the soil.

Any ferns or other hardy plants, or rose-trees that have been planted during the spring, will need more care and more frequent watering than plants that have been established all through the winter and have become hardened.

# DRAWING A CAT WITH THE AID OF TWO COINS

The four little pictures shown here prove to us how very simple a thing it is to make amusing drawings. We need a ten-cent and a five-cent piece, a pencil and a piece of paper. We first put our ten cent piece on the paper and draw a circle round it; then we place our five cents to the right, overlapping slightly, and run our pencil round its edge, being careful not to cut into the first circle. The ears, eyes, nose, mouth, tail, and two curves for hip and elbow, are then inserted, and a few more strokes complete our pussy.



# HOW TO MAKE OLD CLOTHES NEW

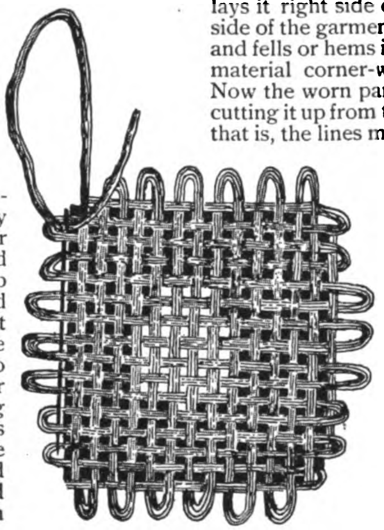
## A LESSON IN DARNING, PATCHING, AND MENDING

Every girl should know how to repair the inevitable damage done to her clothes by constant wear and tear, and there can be no comparison between a hasty, bungled mend and a neat patch or a smooth, even darn. Let us first consider darning, work which incompetent needlewomen often dislike very much. We are going to see how, with a little patience, we may obtain quite beautiful results.

### Darning

The darning thread should be fairly soft, not too coarse for the material, and as like it in colour and texture as possible. When about to darn a stocking we thread the long-eyed darning needle by holding it in the right hand, point downwards, loop the end of the woollen mending over it, draw the needle out of the stretched loop so formed, and with the finger and thumb of the left hand press the looped mending through the eye. No knot is wanted.

We start darning on the wrong side at the left bottom corner of the hole—not close up to it but outside the part wearing thin, for, if the darn is not begun beyond it, this worn part will give, through the increased strain, directly the stocking is put on. The stitch is really a weaving of the mending thread with the worn and broken threads of the stocking, the needle taking up as many stitches as it can conveniently hold, picking up a thread, then leaving one, first in a row away from us, then in a row towards us. We must then take care, before drawing the thread up loosely with the right hand, after taking the needleful, to hold down with the left thumb the loop forming at the end of the thread, and leave it there to allow for shrinkage in washing. We should also be careful not to pucker the material when pulling the thread. The stitches are repeated in the same direction, backwards and forwards, and the thread crossed over the hole when we arrive at it. It is better not to let the row of loops at the ends be in line, but in steps up to the longest stitches made across the hole, then down again beyond it. This prevents too great a strain on the two threads at the ends of the darn; but, of course, the shape of the darn must depend on that of the hole.



1. A darn

Having finished this warp darning, we cut the mending thread, turn the stocking round to the left and cross the previous threads as shown in picture 1, in a kind of lattice-work, taking care not to pierce the darning already done, but passing the needle over and under the strands alternately. The crossing is done in a regular oblong. Careful darners always put a hard wooden ball in the foot of the stocking and mend on that.

### Patching

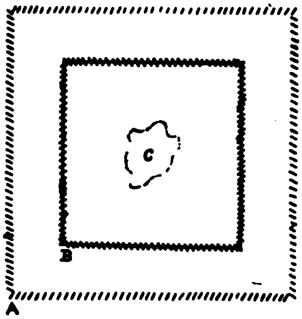
When a garment becomes worn and ragged in one part, and the possibility of darning it is hopeless, we have to patch it. For the patch we want a piece of material to match the garment. This is a matter of importance, for it would not do to use a thinner, more flimsy piece of material, and equally it would not do to apply a thicker, more coarsely woven one. If the colour of the garment has faded, and we have a piece of unused cloth in which the colour is still bright, we can usually make the colour fade by exposing it to the sun or washing it in water with a little soda dissolved in it.

We will suppose a little girl has worn a hole in an under garment, and she is going to sew on a patch. She lays the piece of calico over the garment with the hole in the centre, and cuts out of it a square or a four-sided piece, according to the shape of the hole. The piece must be a good deal larger than the hole. Next she lays the garment on the table right side downwards, folds over the edge of the patch on to its right side and lays it right side downwards on to the wrong side of the garment. Then she tacks the patch, and fells or hems it on, folds the patch with the material corner-wise, and turns the garment. Now the worn part has to be taken away by cutting it up from the hole along the diagonals, that is, the lines made when she folded the material from corner to corner, as if she wanted to make a triangle, until a point is reached clear of the worn part, and enough material is left to turn under and sew on to the patch, as shown at B in picture 2; A, of course, shows the outer edge of the patch, and C is the original hole. In sewing round this inside square, care must be given to the corners. She snips these up a little way and turns the edge under with her needle. The patch should lie flat; it will do so if the width between the fell and the sewing is three-eighths of an inch wide.

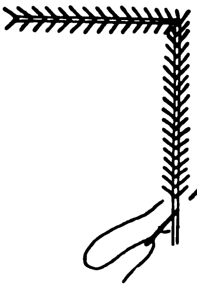
A flannel patch is herringboned on to a garment as shown on page 935, for the patch would not lie flat if it were filled and sewn on exactly like a calico patch. For a patch at the elbow or near a seam, rip up the seam, and make a new one for one side of the patch. Be careful to see that the patch and the material have their threads running in the same direction.

### Repairing a Slit

Slits will sometimes spoil the nicest frocks. A straight, clean-edged slit is easy to repair, for we can place the two edges together and darn or fine draw it—that is, draw it together with fine warp darning stitches; but a three-cornered or jagged slit is more difficult to treat. The method depends on the nature of the tear; sometimes a patch may be necessary. If the material be striped, the edges can be placed together and run on the wrong side. In doing this we slope the running to a point at both ends. Such a little seam is only possible when the stripes are narrow and close together. In the case of a three-cornered tear, we may darn the edges together, using either No. 60 cotton or fine silk, according to the material. No loops are left at the ends as in stocking darning, and the darn is fine drawn with very fine stitches placed close together, so that they are hardly visible to the eye.



2. Patching



3. Fish-bone stitch

A three-cornered tear is often successfully treated by hemming a patch on the back of the material with very fine stitches, and tucking in the frayed edge of the tear with the needle just enough to allow the edge to be hemmed down with fine stitches on the right side. The hems must be quite close together, or the patch will show through. A clean tear in a woollen garment may be mended in fish-bone stitch, as shown in picture 3.

GLOVE MENDING

How long gloves would last if those dreadful holes did not come as it were by magic!

A common fault in glove mending is the use of too coarse a cotton or silk. We should choose quite a fine kind and use a small needle. Then, when the seam of a kid glove splits, it is easy to make the same little stitches as the glove-maker did before. In mending holes in cotton or silk materials, it is best to put the finger of the glove with the hole in it upon the first finger of the left hand, and fine draw the hole. As the hole is usually close to the seam at the tip, we can use the material turned under at the seam, to make a foundation for the tiny darn. We must fasten off the thread on the wrong side, or we shall get that unsightly thread popping out of the finger-ends like a jack-in-the-box. A tear is more troublesome to repair, and this usually comes in a new pair of kid gloves, the skin of which has become rotten, or has a thin, weak spot. If the glove be longer than is really necessary, we can cut off a little strip at the sleeve-end, shape a piece to fit in the tear, and stitch in the patch in the same way as the seams are sewn.

The fewer punctures of the kid with the needle the better. Drawing the two edges close together usually makes matters worse, for the kid is likely to tear in a fresh place.

# OUTDOOR GAMES FOR BOYS AND GIRLS

## BUTTERCUPS AND BEES

This is a new game, but may prove good fun. There should be an even number of players, say, twelve — six girls and six boys: that is, six buttercups and six bees. The buttercups sit or stand on the lawn in a row, each holding a cup made of a piece of paper, twisted into the shape of a fool's cap. A number is pencilled on the inside of each — 1, 2, 3, 4, 5, 6 — according to how many buttercups there are. The bees then stand a short distance away, each with a little ball of crumpled paper. These are numbered as the cups are; but before beginning the game, the boys should exchange balls with one another, so that the buttercups cannot possibly tell the number of any boy's "bee." For the same reason the girls should exchange cups. This being done, and the lines formed again, the paper balls, or bees, are tossed all at once into the air towards the buttercups; the higher the better, and the buttercups do their best to catch them. Any player whose cup-number is the same as that on the bee it has caught changes places with the boy who threw it, and the last couple to do this ends the game. The winners are the couple who have become buttercups or bees in turn the greatest number of times during the game. As some may find it difficult now and then to catch the bee in the cup, it is quite allowable to pick it up from the grass where it has fallen, and drop it in. The exchanges should take place every time the bees are returned, as there would be very little fun to any of the players if either side knew the numbers of the others.

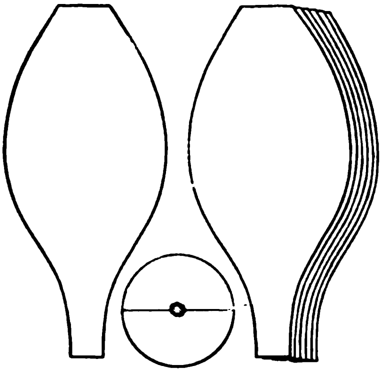
## BATTLEDORE AND SHUTTLECOCK

This game is about six hundred years old, and is still popular. The battledore is made of stretched parchment like a little drum, with a long, light handle. The shuttlecock should not have too many feathers, or it will not fly quickly enough. At first it may seem difficult to keep it in the air with the battledore, but this will soon become easy. Although one player can play alone, it is much better when two players play together, striking alternately at the shuttlecock and keeping it in the air as long as possible. The player who misses loses, and the other player counts a point. If there are several players, they stand in a ring, and pass the shuttlecock from one to the other, the first who fails to strike it being out. The last player left is, of course, the winner.

# MAKING A HOT-AIR BALLOON

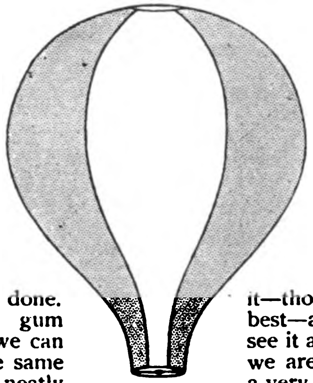
Almost everyone has seen the big paper balloons that are sent up at firework displays. Generally they are made to carry coloured lights, so that when the balloons fly away they can be seen until they rise to such a height that they look like tiny stars in the sky. These balloons are made of tissue-paper, and they are not filled with gas, but with hot air. It is quite easy to make one.

At any stationer's shop we can buy large sheets of tissue-paper. It is best to buy a quire, which will cost about ten cents; and, if possible, we should get two colours. Then we can make our balloon with coloured stripes. When we have got the paper, we must lay it all out flat on a table. Then, with a soft pencil, we can draw on the top sheet the shape shown in picture 1, but as large as possible on the paper that we have. When we have marked the shape, we can fold the first sheet down the centre from top to bottom. This will show us if the two sides of the shape we have drawn are the same. If they are, we can cut round the pencil-lines with a pair of scissors. This first sheet will now form a pattern for all the others. We should lay it over them and cut very carefully through the remaining twenty-three sheets with the scissors, so as to make them all exactly the same size as the first one. We now have to stick them all together very firmly.



1. Pattern cut out 2. Wire ring and wool 3. Pile of sheets for gumming

We first take a white piece and lay it flat. Then place over it a red or blue piece, so that on one side a little of the white shows. Put another white and another coloured one over them in the same way, always leaving a little of the edge of each sheet showing. Picture 3 shows clearly how this must be done. We next brush some thick gum over the edges. In this way we can gum five or six pieces at the same time, and do it much more neatly than if we did each piece separately.



4. The completed balloon

When the gum has been spread smoothly, we pick up the top sheet and carefully stick the edge to the ungummed side of the sheet below. The same thing is done with six sheets, using white and coloured pieces alternately, and then joining the first and the last sheets. We shall now have a paper balloon, complete except for a small hole in the top. To cover this we cut a circular piece from some of the paper we have left over, and then stick it carefully and very neatly over the hole. When the gum has dried, we must put the nose of a pair of bellows into the opening at the bottom and blow air in gently. In a few minutes our balloon will expand, and we can see if all the edges have stuck properly. If they have not, we must put on a little more gum, because, of course, the balloon must be air-tight.

We must now measure the opening at the bottom, and with a piece of thick wire make a ring that will just fit into it. We fix one piece of wire across the centre of the ring, as shown in picture 2, and in the middle of this straight piece put a little tuft of cotton-wool. Now we very gently fix the ring into the opening, fold the edge of the paper over it, and gum the folded part down firmly. Our balloon is now quite finished, as we see it in picture 4. Taking it out into the garden, we choose a place sheltered from the wind, and then pour a little alcohol or oil on the cotton-wool, being very careful not to let any of the spirit get on to the paper. When it is all ready, we should get somebody to hold the balloon up for us while we put a match to the cotton-wool. We must do this very, very carefully, because everything depends upon this moment. If the little flame from the spirit touches the tissue-paper, it will, of course, burn a hole in it. In a few minutes the hot air will make the balloon expand till it is nicely rounded out. Holding it until it looks quite full, we then gently let it go. It will rise very quickly into the air, and will go to a tremendous height. We shall have plenty of paper left, and can make another at once. If we send the next one up at night, we can tie a small firework to it—those called Bengal lights are the best—and then we shall be able to see it as long as the light burns. If we are very ambitious, we can make a very much larger balloon by sticking sheets of paper together before we begin to cut out the shaped pieces. The whole secret of sending up the balloons is to choose a starting-place sheltered from the wind. Of course, on a very windy day it is no use trying at all. A moderate breeze does not matter, because if the balloon is sheltered until it has risen a little way it is safe.

There is no danger, because the balloons are taken into the garden before the spirit is used. Even if the tissue-paper catches fire through our want of care, it can be crumpled up and put out in two seconds.

# DELICIOUS COCOA-NUT ICE

COCOA-NUT ice can be made with or without milk, but it is certainly nicer and smoother when made with it. To make a really nice sweetmeat we shall want ingredients in the following proportions: half a pound of desiccated cocoa-nut—the word desiccated only means dried, but it is the proper thing to ask for when buying it at the grocer's—one pound of loaf sugar, a small teacupful of milk, and half a teaspoonful of carbonate of soda.

First we put the sugar into a large enamelled saucepan and pour the milk on to it. Then we put the saucepan on the stove, and let the contents come to the boil, stirring all the time to prevent burning. We can tell when it boils by the fussy bubbling it makes. The milk is allowed to go on boiling for five minutes, while we are still very careful to stir rapidly. Then the carbonate of soda is stirred in. The contents of the saucepan must not be allowed to boil over. Next we take the saucepan off the fire, and stir the cocoa-nut into it. A shallow tin is lined with a piece of white paper, and half the contents of the saucepan are poured into it. A few drops of cochineal are then stirred into the remainder in the saucepan, to make it pink, and this is poured on to the cocoa-nut ice in the tin.

We must next press the surface of the cocoa-nut ice even with a knife, and set it aside to cool. When it is cold, we take a sharp, broad-bladed knife and cut it into bars as it lies in the tin.

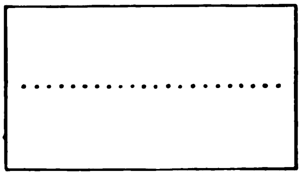
Some people make cocoa-nut ice without the carbonate of soda; but the addition of a little certainly gives lightness to it, makes it more digestible and nicer to the taste. Such a candy is perfectly wholesome, and is not at all likely to make us ill after eating it.

# HOW TO PASS THROUGH A POSTCARD

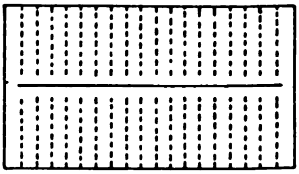
IT seems almost impossible to pass one's whole body through a plain postcard, and yet it is fairly simple to do so.

We must take an ordinary postcard, or, if we have not got one handy, any piece of card or paper the same size will do as well, and cut a slit across the middle to within a quarter of an inch of each side, as shown in picture 1.

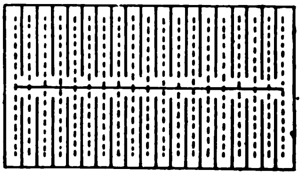
We must then very carefully make straight cuts, about a quarter of an inch apart, from the top and bottom edges of the card to within a quarter of an inch of the slit that we have already made down the middle, as in picture 2. We next make straight cuts from the original slit in the middle of the card to within a quarter of an inch of the top and bottom, taking care that these come exactly in the centre of the spaces between the cuts made from the outside edges. The final result of the cutting is illustrated in picture 3. If we now pull each end of the card we shall find that we have in our hands a long, endless, zigzag ribbon. We should fold the corners of the zigzag ribbon back carefully, and when this is done we have a huge paper hoop through which our body can easily pass.



1. Where to make the first slit



2. The second series of cuts



3. The complete series of cuts

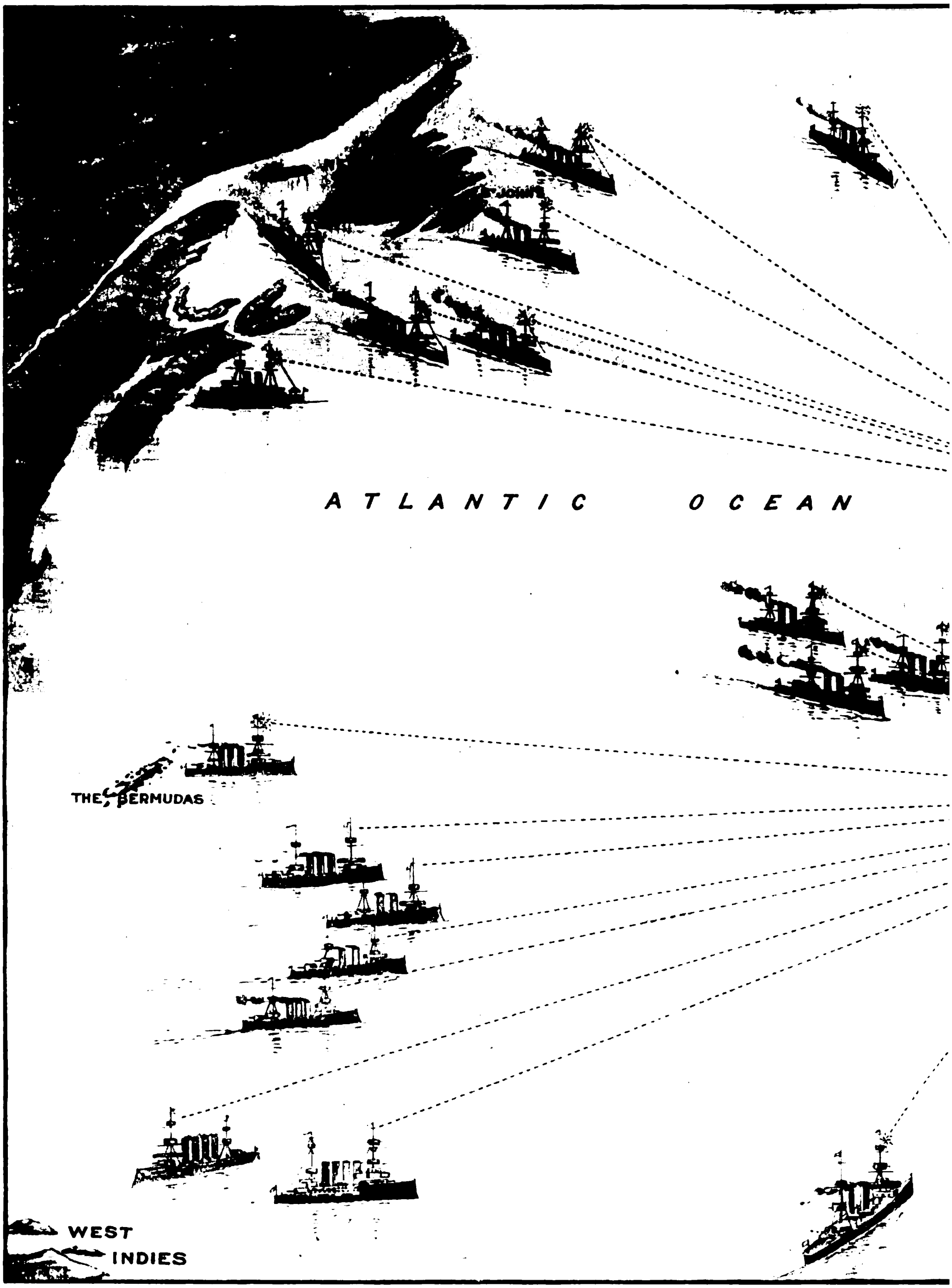
# ANSWERS TO THE PICTURE PUZZLES ON PAGE 3389

ON page 3389 are twelve little pictures, in each of which the artist has made a mistake. The following solutions are the correct ones:

1. The shells are those of a walnut, but the kernel that has apparently come out of them is that of a Brazil nut.
2. The little girl is gazing out of the window at the crescent of the moon, which is in a position in which it never appears to us.
3. The buttons on the man's coat are on the left side, whereas they ought to be on the right side of the opening in front.
4. This chicken has a duckling's beak.
5. A lion cannot climb a tree, though many other members of the cat tribe can do so.
6. Hens and chickens never enter a brook, pond, or river for the purpose of taking a swim.
7. Tigers do not eat grass or hay, but live entirely upon flesh. They are carnivorous.
8. The rabbit in the picture has a tail similar to that of a squirrel.
9. This curious animal is an echidna, commonly called an Australian ant-eater. In this drawing it has the hind legs of the ornithorhynchus. The hind legs of the echidna are shaped backwards and outwards, and are not webbed.
10. The antelope shown is found in hot countries, and could not live in the Arctic regions.
11. The boy is mounting his pony from the wrong side. The correct side from which to mount is the left or near side.
12. The boy is writing with his right hand and the mirror reflects him also writing with his right hand, whereas a mirror should always reverse everything as it reflects it.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 3611

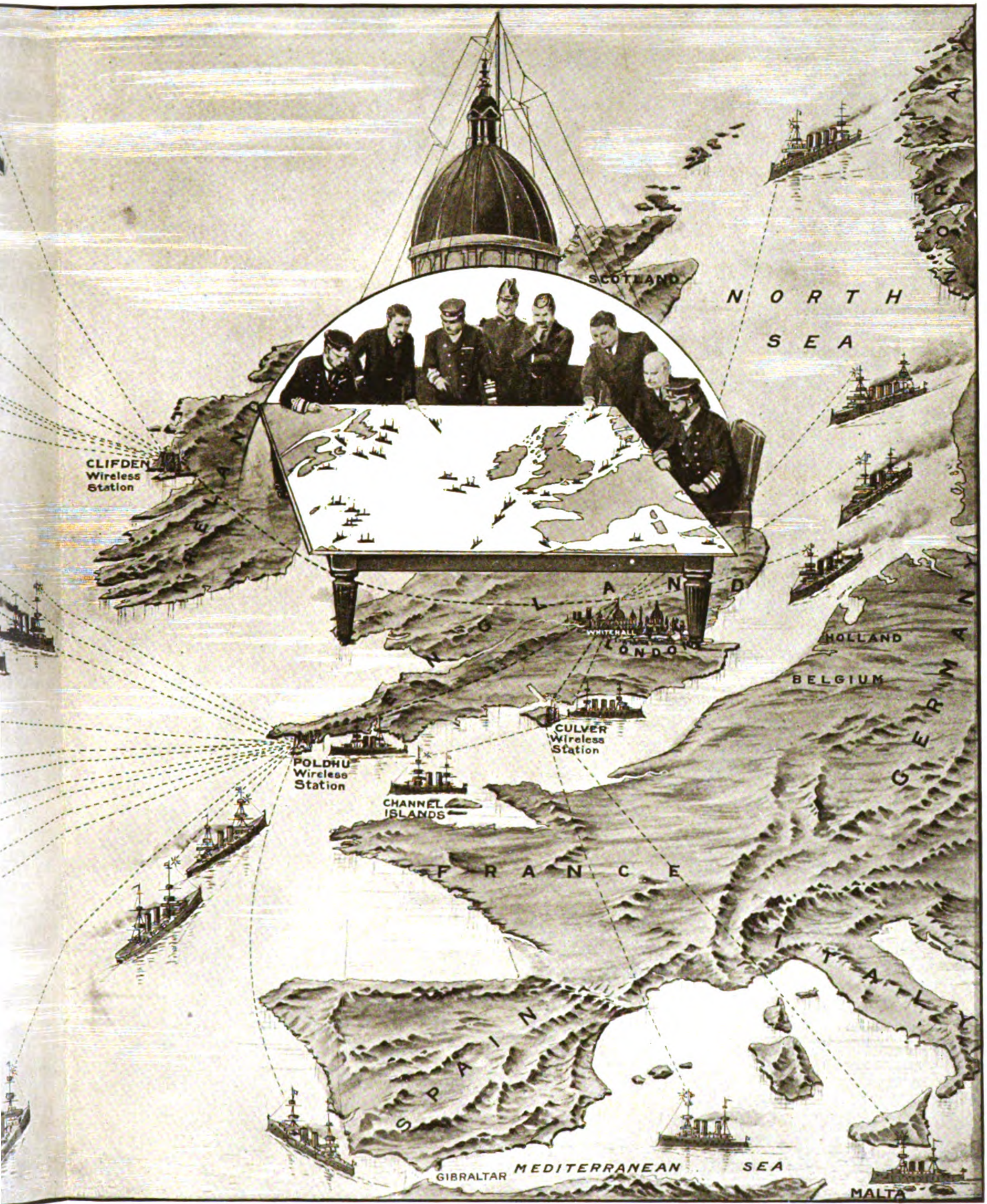
# HOW THE SHIPS OF THE BRITISH NAVY AR



The world is becoming a more wonderful place to live in every day. We can speak to people hundreds of miles away; we can send messages round the world in less than five minutes. In this picture, the artist has tried to show one of the greatest marvels that the mind of man has yet achieved. Upon the dome of the new Admiralty Office in Whitehall is a mysterious entanglement of wires which must have puzzled many passers-by. These wires are part of one of the great wonders of our time; they mean that men can sit in a little room in London and be in touch with ships more than a thousand miles away. It is wireless telegraphy that has made it possible for men thus to sit under the dome in Whitehall and watch over the British Navy 1,500 miles away, as a shepherd, seated on a hillock,

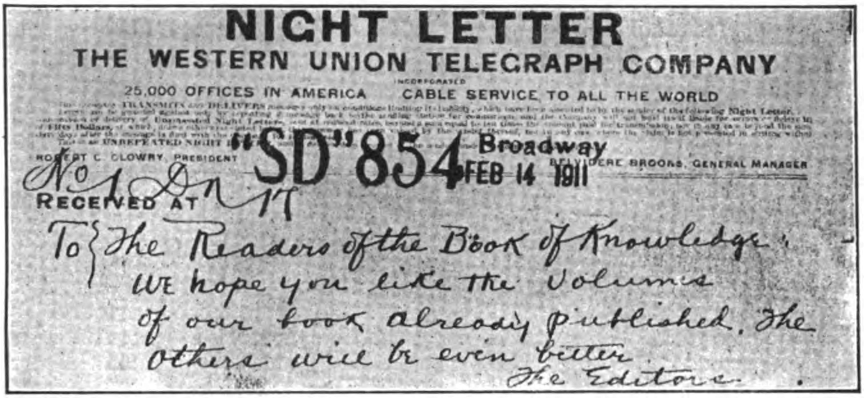
watches over his flock of sheep in th
show us how this is done. Grouped
studying a map, which shows the At
as the British Isles and a part of Eur
shall see that it represents in every p
vessels at sea. Arranged on the m
the ships themselves are placed at
Cornwall, and at Culver in the Isle o
which a ship can flash a message th
message flashed to them. All the

# ARE WATCHED FROM A TABLE 1,500 MILES AWAY



sheep in the fields around him. The artist has tried to
. Grouped around a table are admirals and naval lords
hows the Atlantic Ocean and a part of Canada, as well
a part of Europe. If we look at this map on the table, we
its in every particular the larger picture map with all the
ed on the map are tiny models of ships, placed exactly as
re placed at sea. At Clifden in Ireland, at Poldhu in
in the Isle of Wight, are wireless telegraph stations, to
message through the air in a few minutes, or receive a
m. All these stations are also in communication with

London, and their messages, carried by the mysterious electricity in the air, come to the wires we see above the Admiralty tower. From there, the messages are received in the telegraph room, and immediately given to the watchers by the table. Thus, by means of the model ships, the watchers at the Admiralty can tell at any moment exactly where the vessels are at sea, and can instruct their commanders, by flashing messages to them, to hasten home to the island shores in case of danger, or to go to some other part of the far-spread empire. So it may be said that the eyes of the Admiralty see 1,500 miles away, and that the men standing in this room in London can actually command the movements of a naval battle far off in the Atlantic Ocean.



NIGHT LETTER

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No 1 Dn

RECEIVED AT 17

To { The Readers of the Book of Knowledge:
We hope you like the Volumes
of our book already published. The
others will be even better.
The Editors.

# HOW WE SEND A TELEGRAM

CONTINUED FROM 3453

NOBODY can say what electricity really is. It is not matter. It cannot be seen, though its effects can; it cannot be smelt or tasted. We call it a fluid because we cannot give it a better name. But though we do not know what it is, we know how to bring it into use, how to create or excite it, how to harness it, and make it our most marvellous and obedient servant; and one of the chief wonders electricity performs for us takes place after we hand a telegram to the clerk of a telegraph office. A telegram is one of the familiar things in our lives which are really so wonderful that no man can quite understand them.

If we wish to send a telegram from Boston to New York, we must have in the first office a battery from which we can send electricity along wires. The wires coil round a piece of iron, and so long as the current of electricity is passing through the coil the iron acts as a magnet—an electro-magnet, as it is called—and draws other metal to it. The moment the current ceases, the iron is no longer a magnet. We see a picture of this electro-magnet and battery on page 3524. When we send the electricity through this coil, we call it magnetising the coil. The current flies swiftly along the wire, and while it is going the circuit is said to be closed. When the current ceases, the circuit is broken. Now we hand our telegram for New York to the telegraph operator. Before him there is a little lever with a knob at the end. This lever is called a key. While that key is at rest, the circuit is broken. The moment he presses it down, the circuit is closed, and the current races along the telegraph wire. He taps away at his key, and the message flies over the wire, to be written down at the New York office. How is it done? New York is the receiving end. Well, at the end of the wire, they have an electro-magnet made as we have seen, of wire and iron. This magnet in the receiving office is shown on page 3525. A current comes

Taking a Telegram.

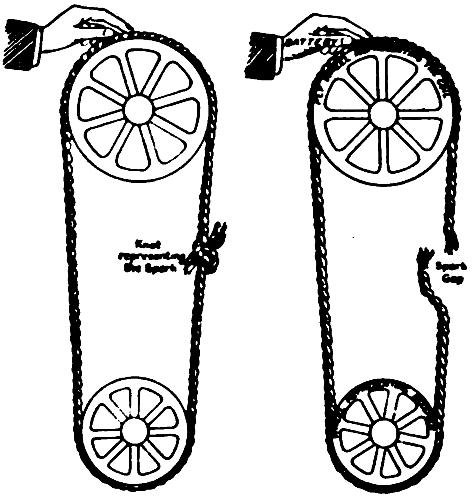
from Boston It enters the office by the wire. It passes through the coil and makes the iron magnetic. The magnet attracts towards itself a little metal bar working on a lever, and every time this bar comes down towards the magnet, the end of it taps upon a small screw; then when it goes up again it taps on another screw. Each tap that it makes corresponds with something that the clerk in Boston has done at his end of the wire.

The Boston clerk, as we have seen, presses down a key. That key, when at rest, has its knob raised in the air. There is a wire attached to the key. Now, when the key is pressed down, its under side touches another wire. The pressing down of the key joins these two wires together. That closes the circuit. The joining of the two wires instantly causes a current of electricity to flow from the Boston battery over the wire to New York. The instant that the key is allowed to rise from the wire underneath it, the current is stopped, and the circuit is broken. While the current is flowing, the coil and iron in New York become a magnet, that draws towards itself the small metal bar.

Clever men thought out a way of making this of use. They arranged that certain pressures by the sending key should stand for certain letters. We have only to agree once for all that a certain sign shall stand for a certain thing, and then we know what it means. And that is how we got the telegraph's A, B, C. A very short pressure of the key in Boston gives two taps in New York, one very quickly after the other, and a longer pressure gives two taps, but with a longer interval between them. These double tappings, one with a short interval between the taps, and the other with a longer pause, correspond with the dots and dashes of the Morse alphabet, which we see on the opposite page, and about which we read on page 3515.

When we send our telegram from Boston to New York, the operator turns the letters which we have written into telegraphic letters by tapping away at his key in the manner agreed upon. Each tap is registered in New York as it is made. With each pressure upon the key the circuit is closed, and the current flies for a certain length of time, signifying a sign which means part of a letter. Each time the key is at rest in its ordinary position, the current ceases to flow.

But there is a limit to the speed at which a man can tap his key. If he is very skilful and strong he may be able to send as many as forty words a minute. More likely he will not be able to send more than twenty-five. That is not quick enough when the message which he sends, instead of being a little telegram from one of ourselves, is a long one of thousands of words—a speech, or the account of some great event. For this, another system is used. A message of twelve hundred words, for instance, would be divided among, say, ten clerks, each of whom sits before a machine that punches holes in a ribbon of paper, the holes corresponding to the letters of the Morse alphabet. Each clerk punches 120 words of the message, at the rate of 25 words a minute, so that, when the work is divided in this way, the whole message is punched out on the tape, or ribbon, in about five minutes. The ribbon is then run through an elaborate telegraph instrument, called an automatic transmitter, because it works itself. The ribbon runs through in such a manner that the

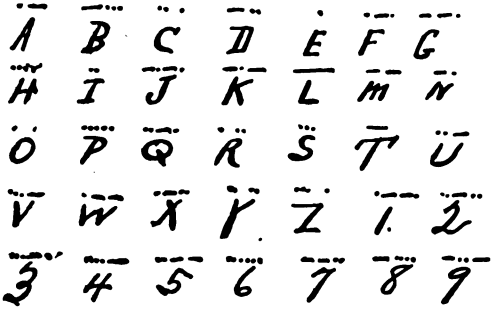


**This diagram explains the uses of the battery, coil, and wires in the sending of a telegram. The hand stands for the battery, which provides the energy. The big wheel represents the *coil*, which regulates the electric current to flow as we want it. The rope represents the flow of the *current*, conveying the energy to the small wheel, which stands for the receiving end. The knot is for the *electric spark*, which ties the ends of the rope, or current, together, as it were. When the knot is tied, the circuit is closed. When the knot is untied, the circuit is broken. It is the rapid tying and breaking of the spark-knot that produces the electric waves.**

circuit is closed at each hole in the paper representing a dot or a dash, and the current flows along the line, to be registered at the other end, in ink, upon a tape. By this machine, messages can be sent at the rate of 400 words a minute. The recording of the dots and dashes upon a tape at the receiving end is necessary, because no clerk could write out the message at the rapid rate at which it is received. The writing out is done from the printed dots and dashes on the receiving tape.

We do not find this recording instrument in the small offices. The instrument which is used in railway signal-boxes and stations is what we call the needle instrument. There we find a little dial, in front of which a needle works to right or left, according as dots or dashes are meant. By watching this, the operator can take a message quite easily. But as the needle moves to right and left it strikes upon two little bars of metal, each different from the other, so that they give out different sounds, and by listening, without watching, the clerk is soon able to read the message by sound, just as the clerks in the other offices do with their improved instruments.

Perhaps the greatest wonder of the telegraph line is the fact that several messages can be sent at the same time. Two messages can be travelling over one wire at the same time from Boston to New York, while two others are coming at the same time over the same wire from New York to Boston. This is done by arranging different strengths of current. The messages that are travelling together from the south to the north are each sent by a current which is of different strength from that of the others, and the same is the case with those coming from the north. Each current goes to a receiver, which takes a current of particular strength.



The Morse Code.

If we have relatives away over the sea to whom we may wish to telegraph, we can reach them by a message carried by electricity under the sea. Cables run under the Atlantic and Pacific Oceans, under the Mediterranean Sea, the Black Sea, the Indian Ocean, the North Sea, the English Channel, and so forth. There are about 250,000 miles of these submarine cables in use, so that we can exchange messages with England, Hawaii, Australia, New Zealand, India, China, and every other civilised country. The principle is the same as in the land telegraph, but the wires are different, and the rate of telegraphing is slower, as the current passing through these long wires is necessarily weaker, which makes the recording of the messages received a slower operation.

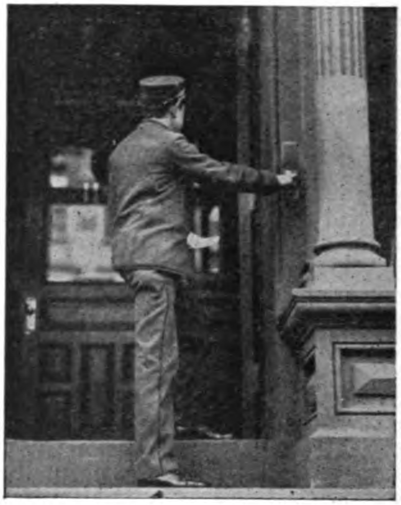
If the ordinary telegraph wires were used, the current would run off into the sea and be lost. So the wires have to be encased in gutta-percha, and bound round with tape and yarn, and brass, and tarred hemp, and over all are wound coils of stout wire, to protect the cable from the sea, and the rocks at the bottom of the ocean. For long distances, only one wire is placed inside the cable, but for shorter ones many can be used. More than one message can be sent over the cable at the same time.

The speed at which cablegrams can travel is very great, though we have not yet the instruments to receive the messages quickly. A signal has been sent 8,000 miles under water in a single second. But we could not send a long message at this rate. As it costs a quarter a word to cable across the Atlantic, codes are used by which one word may mean a dozen or more words. By this means, time and money are saved. Once an English firm cabled to their manager in Victoria, British Columbia, and received the answer in a minute and a half. The distance there and back is 18,000 miles.

Not many years ago at an Electrical Exhibition in Chicago, a message was sent from a room, through the United States to Canada, from Canada to London, from London to Portugal, Spain, Egypt, India, and Japan. It went back by the same route, and was received in the same room from which it had started, but at another instrument. It had been round the world in fifty minutes.

Undoubtedly the most wonderful method of telegraphing is that without wires. We get some idea of how it is done from the story about the telephone, on page 349. It was known for some years that electric waves are carried through the air in all directions, with the speed of light, and this knowledge has been turned to useful purposes.

By the use of an instrument called a transmitter, these electric waves can be sent bounding forth through the air in all directions. By making a receiver in tune with the transmitter, we can make that receiver take a message. To receive the message an instrument called a coherer is used. A coherer is a glass tube, sealed at both ends with metal, and filled with metal filings. When an electric wave comes along, it passes through this tube. It magnetises the metal filings, and causes them to draw close together—to cohere, and to close the circuit. The wave is quickly gone, the filings are no longer magnetised, and the circuit is then broken again.


Delivering a Telegram.

The coherer receives a light tap from a little automatic tapper, and the filings fall apart again instantly, to be as they were before, ready to receive the next electric wave. When the metal filings come together and close the circuit, they operate a bell or sounder, like the simple instrument in the country post-office, and the message which they tick is read and written down, ready to be sent to the person for whom it is intended.

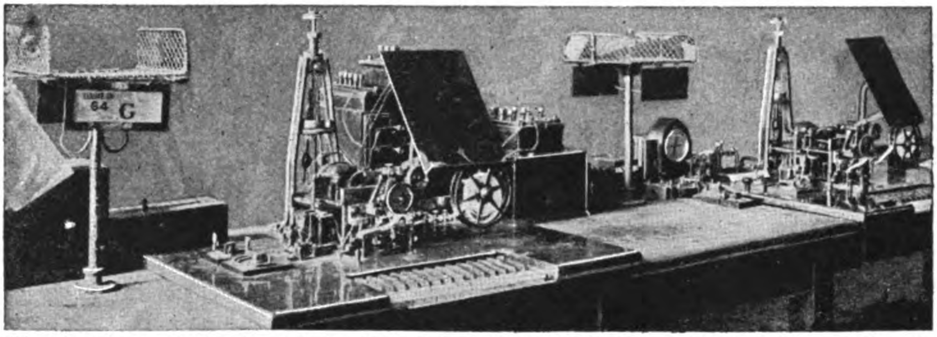
Thus, we send a message thousands of miles across the ocean without the help of wires. Here again the rate is slow. Cablegrams run off at the rate of fifty words a minute, but the wireless telegrams go at the rate of only twenty-five words a minute. Some day, of course, this pace will be greatly improved. Wireless telegraphy is one of the great gifts that inventors have given to mankind, and we cannot yet realise the importance of it to the world. The pictures on these pages show how wonderful is the power that wireless telegraphy gives us to speak across the sea, and only a few months before these words were written there happened a wonderful thing, showing how the power of telegraphy without wires may save great disasters at sea. Let us read the story of how a man tapping away into space saved a thousand lives.

Let us picture to ourselves an immense liner moving slowly from its berth. The quay is crowded with people waving their hands and fluttering handkerchiefs. From the side of the ship, on all the decks, leans a multitude of passengers waving farewell. The space between these two crowds slowly widens. Between ship and shore flows an increasing space of troubled water. The faces of people become indistinct. The sounds die away. Then the engines get to work, and the great ship moves forward, and draws impressively to sea.

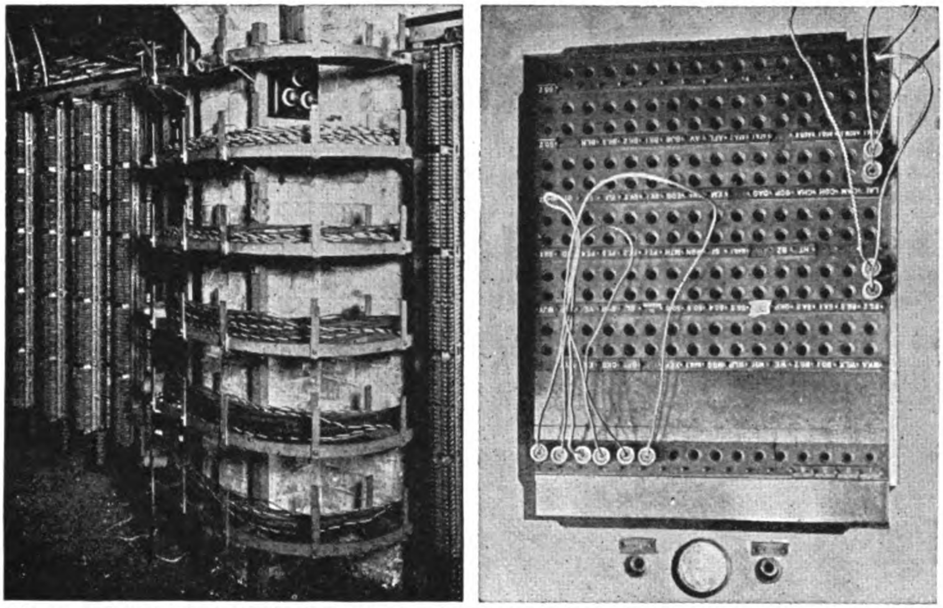
The passengers hurry to their cabins. They see that everything is comfortable for them. They put on great coats and wraps, and take to the decks. Before they begin to walk about, however, they think of their families ashore, their wives, husbands, children, sweethearts. They go to one of the rooms on the ship and write messages of affection and good cheer. They ring a bell. A servant comes, and the messages are handed to him. They are carried to the clerk in charge of the wireless telegraph. The passengers begin to walk about the liner and to enjoy themselves.

In his little room the clerk of the wireless telegraph sits before his machine. On the table in front of him are the messages of passengers, a pile of crowded papers. It is the business of the clerk to send those messages. He flips an A, B, C into the ether, and somehow or another those letters are

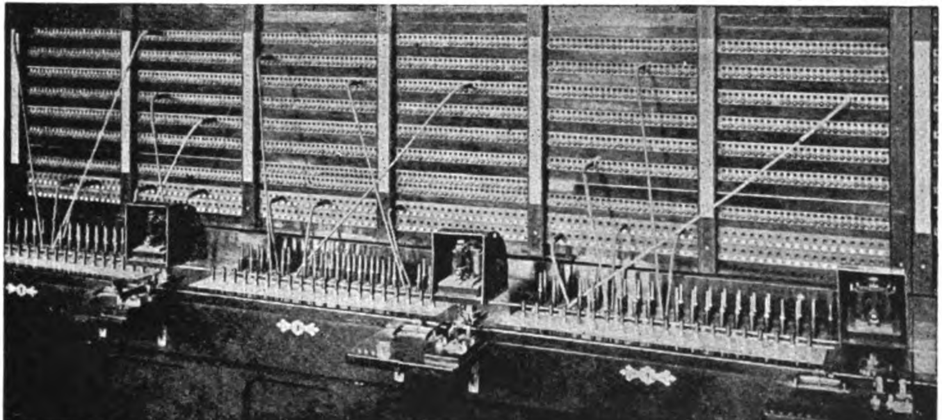
# THE CENTRE OF A MILLION MESSAGES



This shows the wonderful instruments by which messages are sent from London to Berlin, at the rate of 40 words a minute. The sending is done by a keyboard like a piano, and the machine prints the words at the other end.

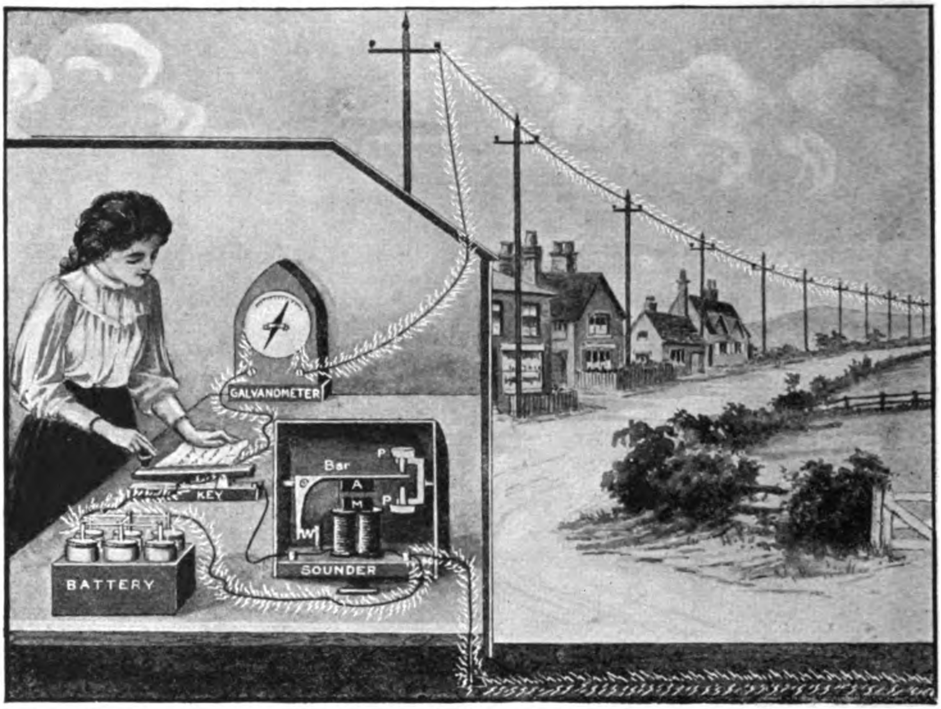


There are about 5,000 wires in the Central Telegraph Office in London, and every wire is tested from time to time to see that it is in working condition. On the left we see the wires all numbered, and on the right is a test-box.



This is one of the ten sections at the Central Telegraph Office, London, where operators switch through the wires connecting up all Greater London. They work at lightning speed, and have a marvellous knowledge.

# THE TELEGRAM STARTS ON ITS WAY



In the left corner we see the interior of a telegraph office. Outside we see the wires running across country. The girl is sending a telegram to the office shown on the next page, hundreds of miles away. Each time she presses down the key with her right hand, a current runs from the battery, through the key, which connects the two wires, through the galvanometer, and out over the wires to the far-away town.

received on shore. They travel without wings, without wires; they arrive.

A fog descends upon the sea; the engines are slowed; the foghorn begins to sound.

Tap, tap, says the operator, earning his daily bread.

*Crash!*

A noise like thunder. A shock that sends everything flying. A tearing and rending and splintering of timbers. A dull, thudding crumple of steel plates. The roar of water rushing in. The staggering shudder of the whole ship. Shrieks and cries of people from every quarter. Voices shouting through the fog—loud voices of command. And darkness. Every electric light goes out.

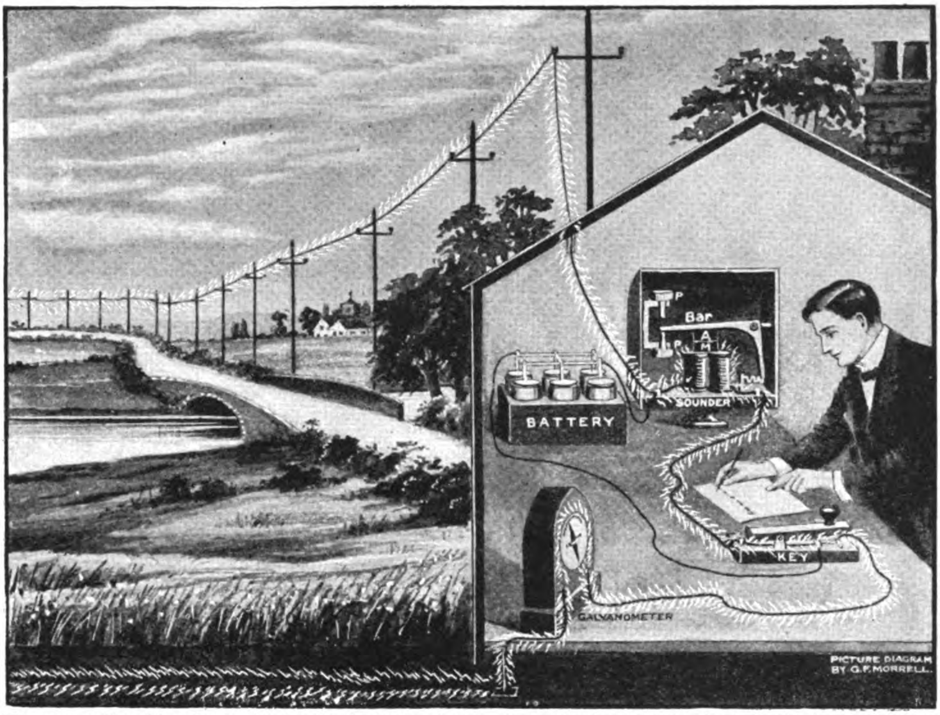
The operator interrupts a sweetheart's message, and taps out the letters C, Q, D. Through the cries of the passengers, above the shouts of command, piercing the black fog and winging wingless over the ocean, those invisible letters strike on the "receiver" ashore, and on numerous "receivers" aboard other ships, almost at the moment when the operator sets them free. They mean to those who receive them: "In serious trouble, need immediate help."

What has happened? The steamer Florida has rammed the great White Star liner Republic. The water pours in, the pack of panic-stricken humanity waits for death.

Through it all the operator sits amid the ruin of his office, tapping, tapping, tapping his messages into space.

On another vessel, in another little office, another clerk sits tapping away at the ether. The telegraph operator on the Baltic was sending his passengers' messages home when his receiver recorded the distress call from the Republic. The sinking ship was sixty miles away, drifting in a dense fog, and the Baltic changed its course and set out to find it. From half-past seven in the morning till half-past six at night the Baltic scoured the sea, talking all day long to the ship that was sinking with a thousand lives. All day long on the sinking ship sat the telegraph operator,

# THE TELEGRAM AT THE OTHER END



We are sending this telegram by the simple single-wire system, so the clerk has to write down the dots and dashes as they sound. Each shock pulls down the iron marked A, causing the bar to strike the pegs P P and sound the "dots" and "dashes." From the girl, the current passes along the wires, then back through the instrument, **into the earth. When the man telegraphs, the current goes into the earth and back along the wires to the girl.**

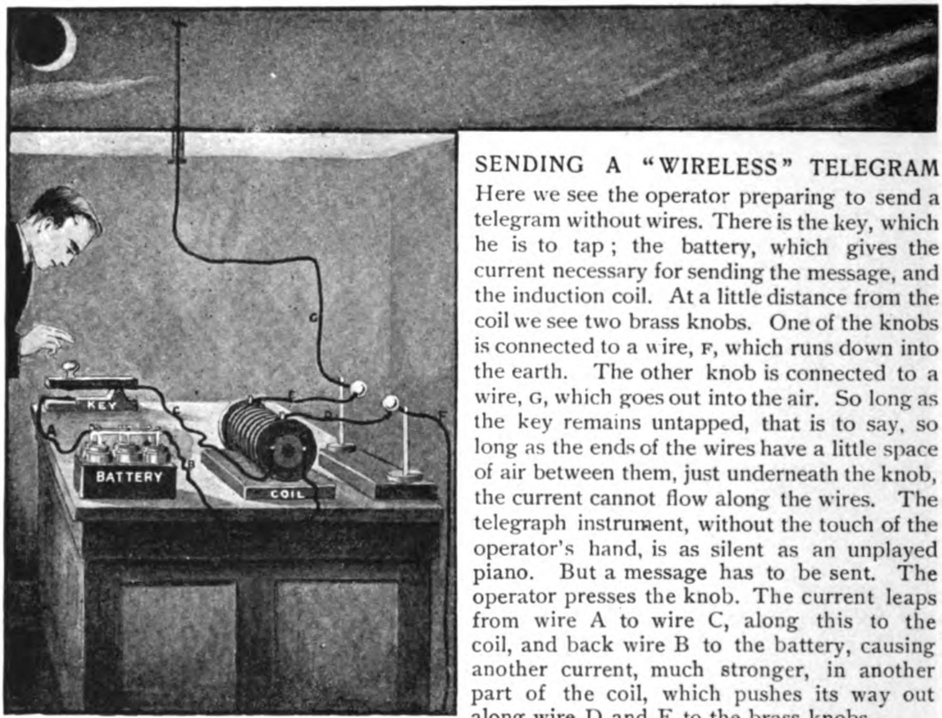
tapping into space a signal of distress. Let us try to imagine the scene. Two ships are in peril in a thick fog. Two thousand men, women, and children prepare to die. In a little room on one of them, a man is tapping at a keyboard, tapping into space a bitter cry for help. The air-waves, set in motion by his tapping, travel sixty miles until they find, on another ship, a sympathetic disc on which they register themselves; and below, in the operator's room on this other ship, the tapping is repeated, and the ship's distress made known.

Two other ships pick up the silent cry that trembles through the fog, and, all day long, three vessels pursue the sinking ship, with which they keep in touch by constant tapping, by telephone bells at the bottom of the sea, and by communication with telegraph stations on land. It is a thrilling thing to think of, these ships drifting in the fog, talking to each other over sixty miles of space, carrying along an invisible ocean new life for two thousand beating hearts. "We are sinking rapidly," says one message. "We can hear a bomb to the west of us; is it yours?" says another. The Lucania asks the Baltic to "please listen for four blasts." Another ship asks the Baltic to "make as much noise as possible." The captain of the Republic thinks he hears a steamer's whistle, and appeals to the Baltic to hurry, for his ship is "sinking fast."

And then at last, after a whole day's search, steering and zigzagging for 200 miles, the Baltic received the message from the sinking ship: "You are very close now; right a-beam. Come carefully. You are on our port side. Have just seen your rocket. You are very close to us." They were within 100 feet, and saw the faint glare of a green light, and in twelve hours the sinking ships were emptied of their living freight.

Only a few years ago the Republic must have been completely lost, and that catastrophe was saved a few months ago, for the first time in the history of the world, by wireless telegraphy, a power which no man understands.

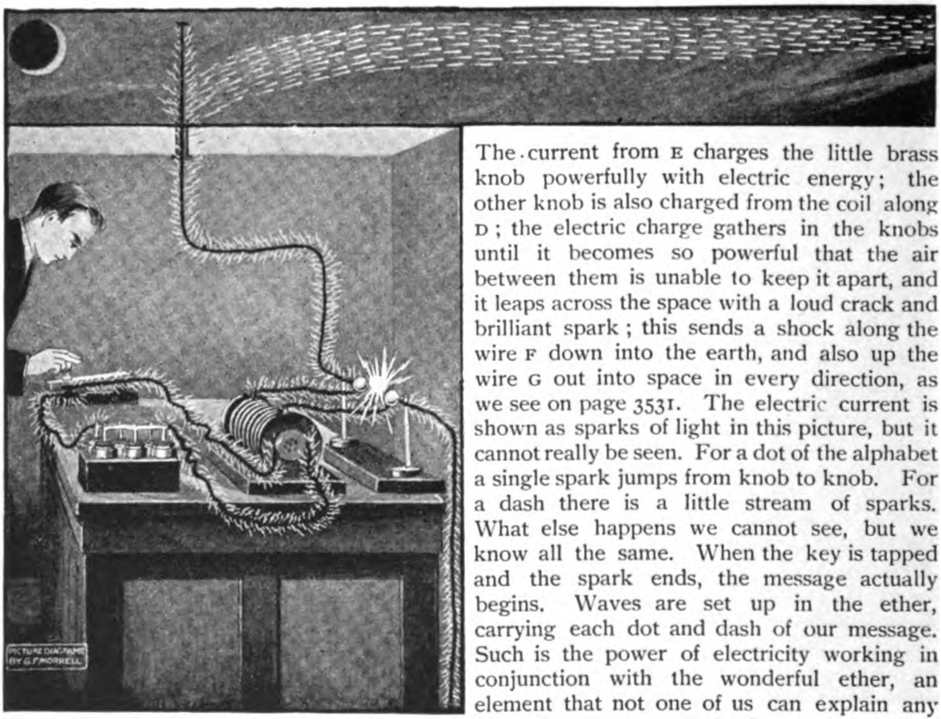
# THE UNSEEN TELEGRAPH MESSENGER



THE OPERATOR READY TO SEND A MESSAGE

## SENDING A "WIRELESS" TELEGRAM

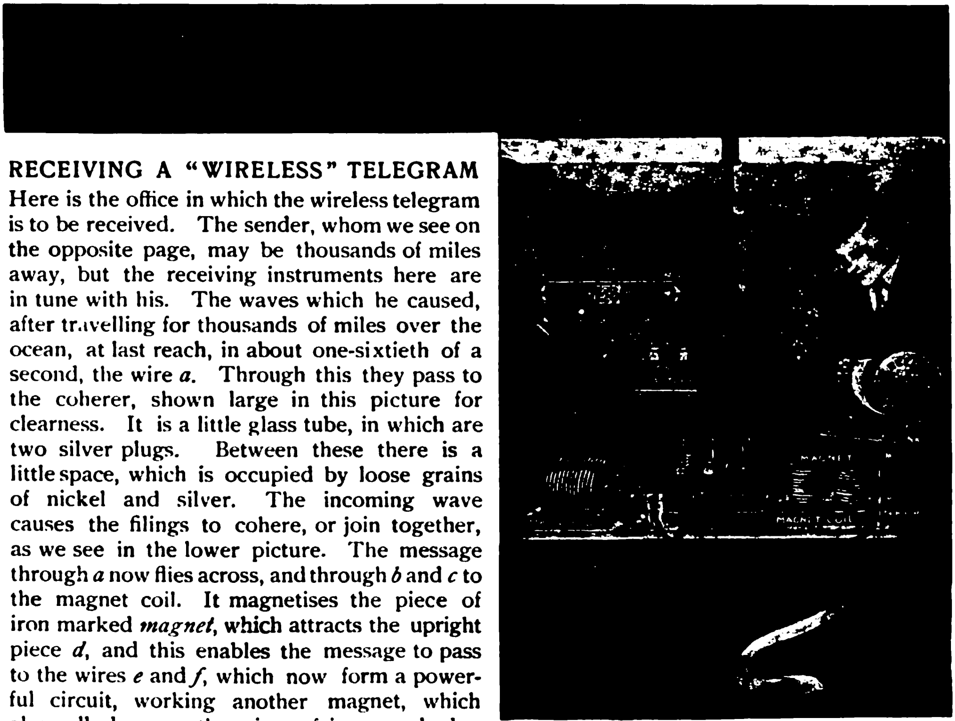
Here we see the operator preparing to send a telegram without wires. There is the key, which he is to tap; the battery, which gives the current necessary for sending the message, and the induction coil. At a little distance from the coil we see two brass knobs. One of the knobs is connected to a wire, F, which runs down into the earth. The other knob is connected to a wire, G, which goes out into the air. So long as the key remains untapped, that is to say, so long as the ends of the wires have a little space of air between them, just underneath the knob, the current cannot flow along the wires. The telegraph instrument, without the touch of the operator's hand, is as silent as an unplayed piano. But a message has to be sent. The operator presses the knob. The current leaps from wire A to wire C, along this to the coil, and back wire B to the battery, causing another current, much stronger, in another part of the coil, which pushes its way out along wire D and E to the brass knobs.



The current from E charges the little brass knob powerfully with electric energy; the other knob is also charged from the coil along D; the electric charge gathers in the knobs until it becomes so powerful that the air between them is unable to keep it apart, and it leaps across the space with a loud crack and brilliant spark; this sends a shock along the wire F down into the earth, and also up the wire G out into space in every direction, as we see on page 3531. The electric current is shown as sparks of light in this picture, but it cannot really be seen. For a dot of the alphabet a single spark jumps from knob to knob. For a dash there is a little stream of sparks. What else happens we cannot see, but we know all the same. When the key is tapped and the spark ends, the message actually begins. Waves are set up in the ether, carrying each dot and dash of our message. Such is the power of electricity working in conjunction with the wonderful ether, an element that not one of us can explain any **more than we can explain the electricity itself.**

MAKING THE ELECTRIC CIRCUIT

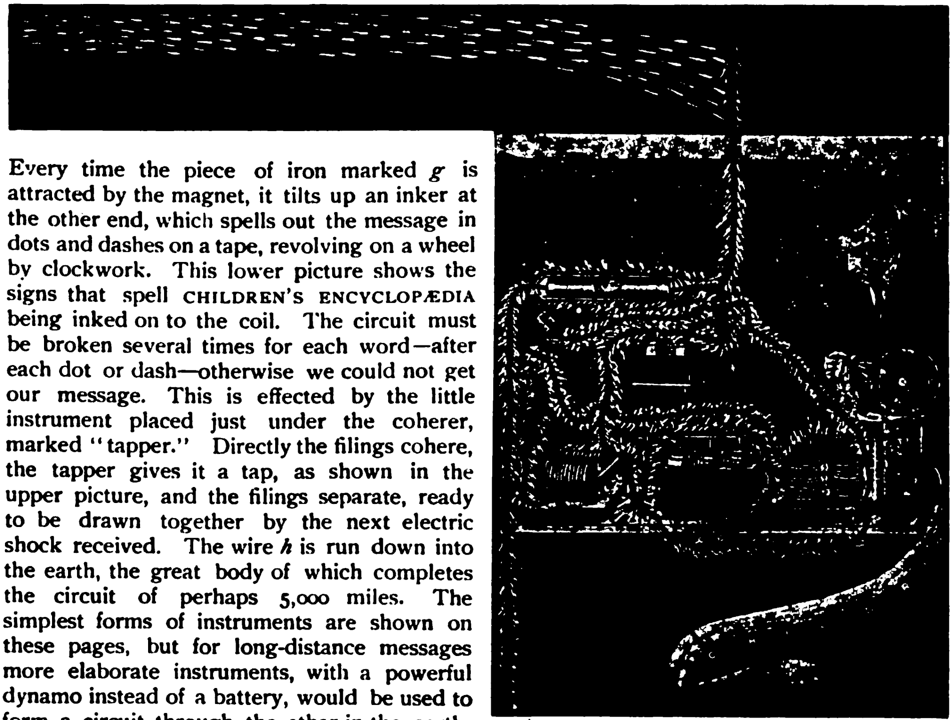
# TURNING ELECTRIC WAVES INTO WORDS



## RECEIVING A "WIRELESS" TELEGRAM

Here is the office in which the wireless telegram is to be received. The sender, whom we see on the opposite page, may be thousands of miles away, but the receiving instruments here are in tune with his. The waves which he caused, after travelling for thousands of miles over the ocean, at last reach, in about one-sixtieth of a second, the wire *a*. Through this they pass to the coherer, shown large in this picture for clearness. It is a little glass tube, in which are two silver plugs. Between these there is a little space, which is occupied by loose grains of nickel and silver. The incoming wave causes the filings to cohere, or join together, as we see in the lower picture. The message through *a* now flies across, and through *b* and *c* to the magnet coil. It magnetises the piece of iron marked *magnet*, which attracts the upright piece *d*, and this enables the message to pass to the wires *e* and *f*, which now form a powerful circuit, working another magnet, which also pulls down another piece of iron, marked *g*.

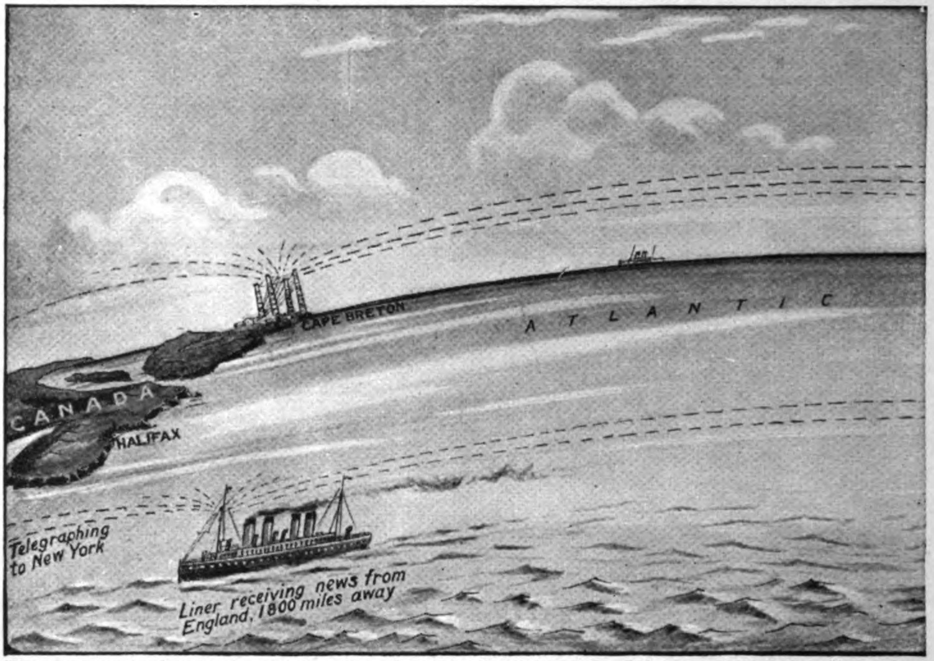
OPERATOR ABOUT TO RECEIVE A MESSAGE



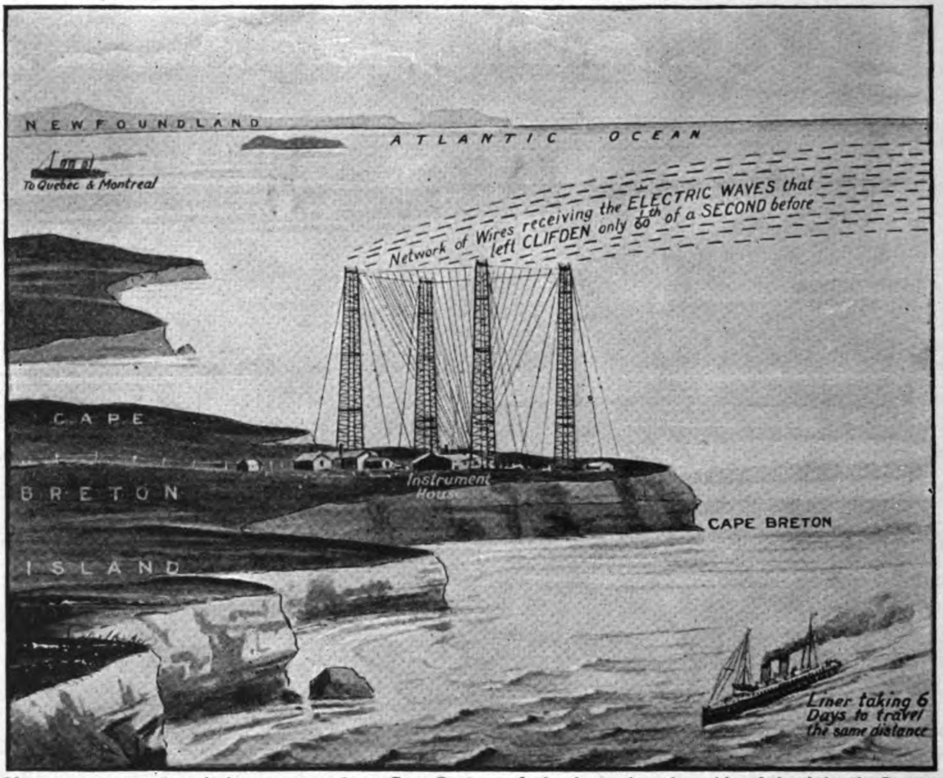
Every time the piece of iron marked *g* is attracted by the magnet, it tilts up an inker at the other end, which spells out the message in dots and dashes on a tape, revolving on a wheel by clockwork. This lower picture shows the signs that spell CHILDREN'S ENCYCLOPÆDIA being inked on to the coil. The circuit must be broken several times for each word—after each dot or dash—otherwise we could not get our message. This is effected by the little instrument placed just under the coherer, marked "tapper." Directly the filings cohere, the tapper gives it a tap, as shown in the upper picture, and the filings separate, ready to be drawn together by the next electric shock received. The wire *h* is run down into the earth, the great body of which completes the circuit of perhaps 5,000 miles. The simplest forms of instruments are shown on these pages, but for long-distance messages more elaborate instruments, with a powerful dynamo instead of a battery, would be used to form a circuit through the ether in the earth.

OPERATOR RECEIVING THE MESSAGE

# MESSAGES THAT FLY THROUGH SPACE

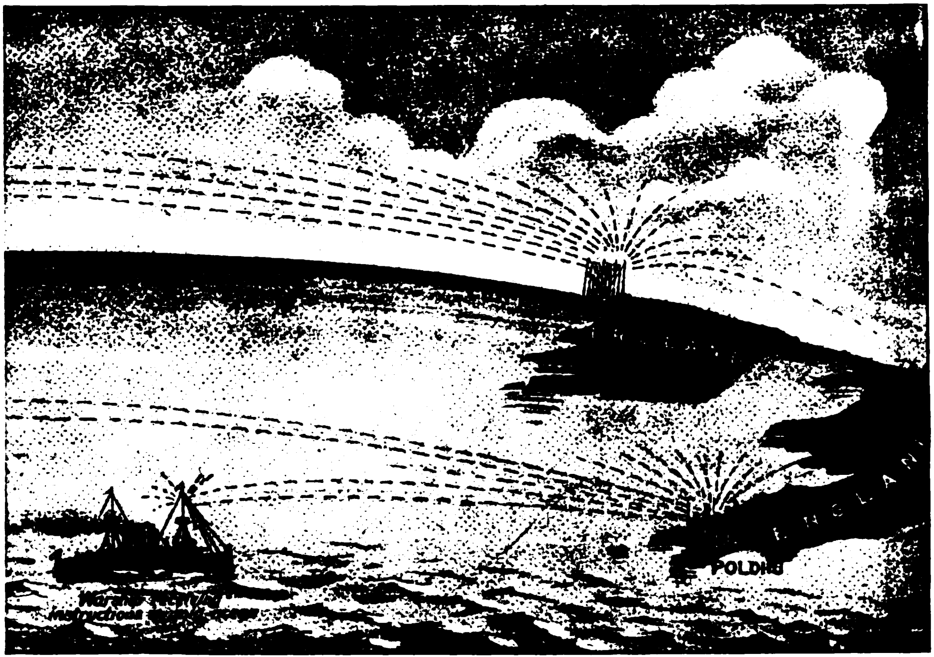


Here we see the latest invention in telegraphy—the wireless system. We tap a key and send a current of electricity along a wire. From the end of this wire the current springs into space and flashes across the sea.

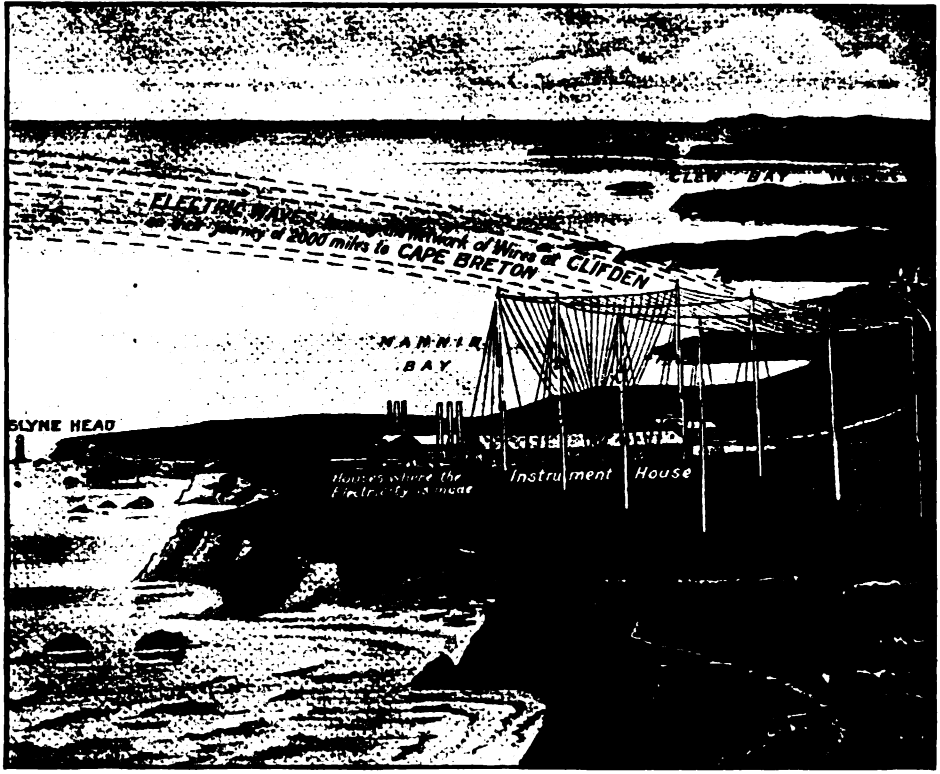

NEWFOUNDLAND
ATLANTIC OCEAN
To Quebec & Montreal
Network of Wires receiving the ELECTRIC WAVES that left CLIFDEN only 1/60th of a SECOND before
CAPE BRETON ISLAND
Instrument House
CAPE BRETON
Liner taking 6 Days to travel the same distance

If we want to send a wireless message from Cape Breton to Ireland, on the other side of the Atlantic Ocean, we tap our key, and the message flies through the air, covering the 2,000 miles journey in the sixtieth of a second.

# THE END OF AN ELECTRIC JOURNEY

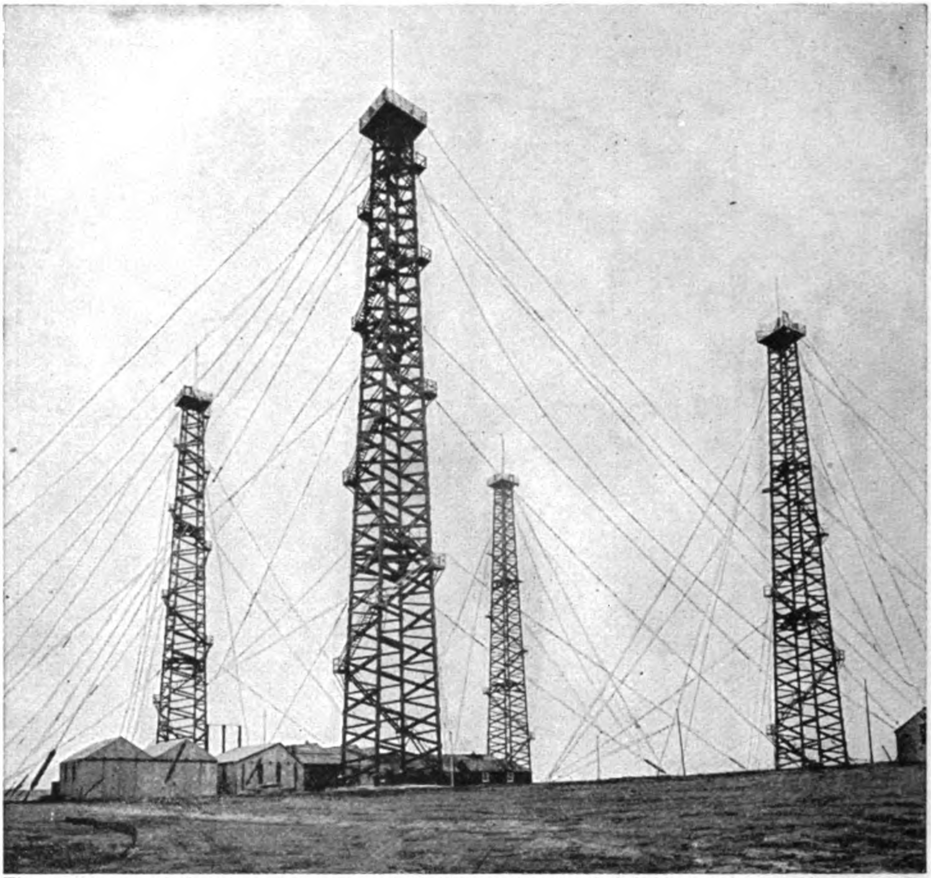


Not only can we send our messages from the Cape Breton station; we can receive messages as well. If we get news for somebody on the sea, we can receive it at Cape Breton and telegraph it out to the ship.

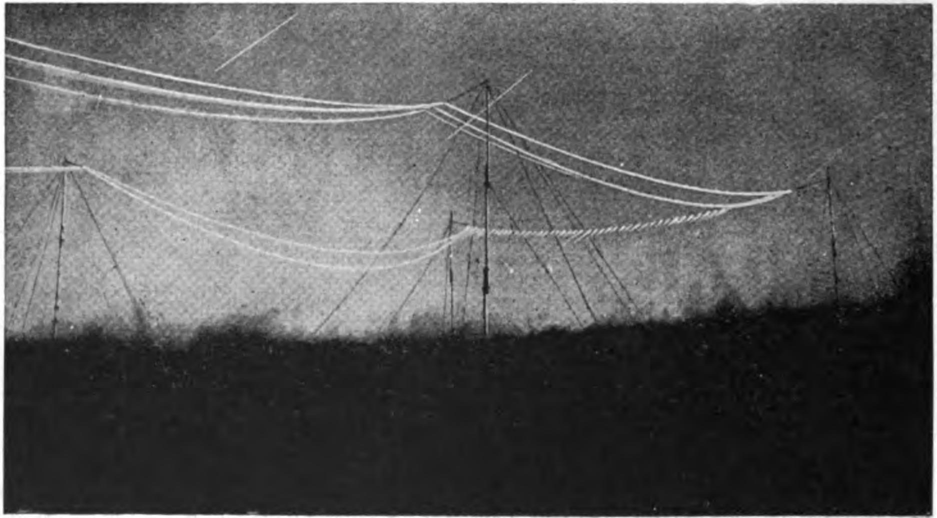

CLEW BAY
ELECTRIC WAVES ... Network of Wires at CLIFDEN
on their journey of 2000 miles to CAPE BRETON
MANNIN BAY
SLYNE HEAD
Houses where the Electricity is made
Instrument House

Of course, though we call it wireless telegraphy, we have wires at the receiving and despatching points. High posts are erected at the instrument houses to catch the waves as they fly to us from those who send the message.

# A WIRELESS STATION BY DAY AND NIGHT

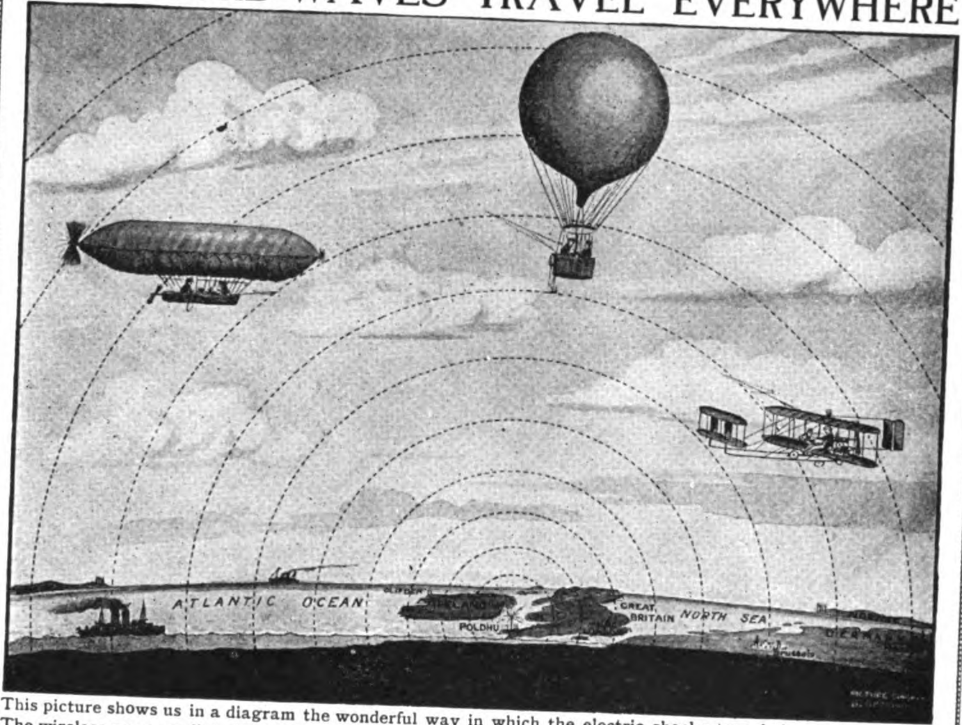


The structures, with the wires at the top, are built high so that the electric waves, when starting across the sea, may not meet with obstructions. On striking the ocean they leap from crest to crest of the sea-waves.



This picture gives us a glimpse of a wireless telegraphy station by night. Whether it be light or dark, the wonderful waves created by the power of electricity speed on their way across the waters. Receiving instruments are ready to record their message, and the words fly, in dots and dashes, speedy as light, and as noiseless.

# HOW WORD-WAVES TRAVEL EVERYWHERE

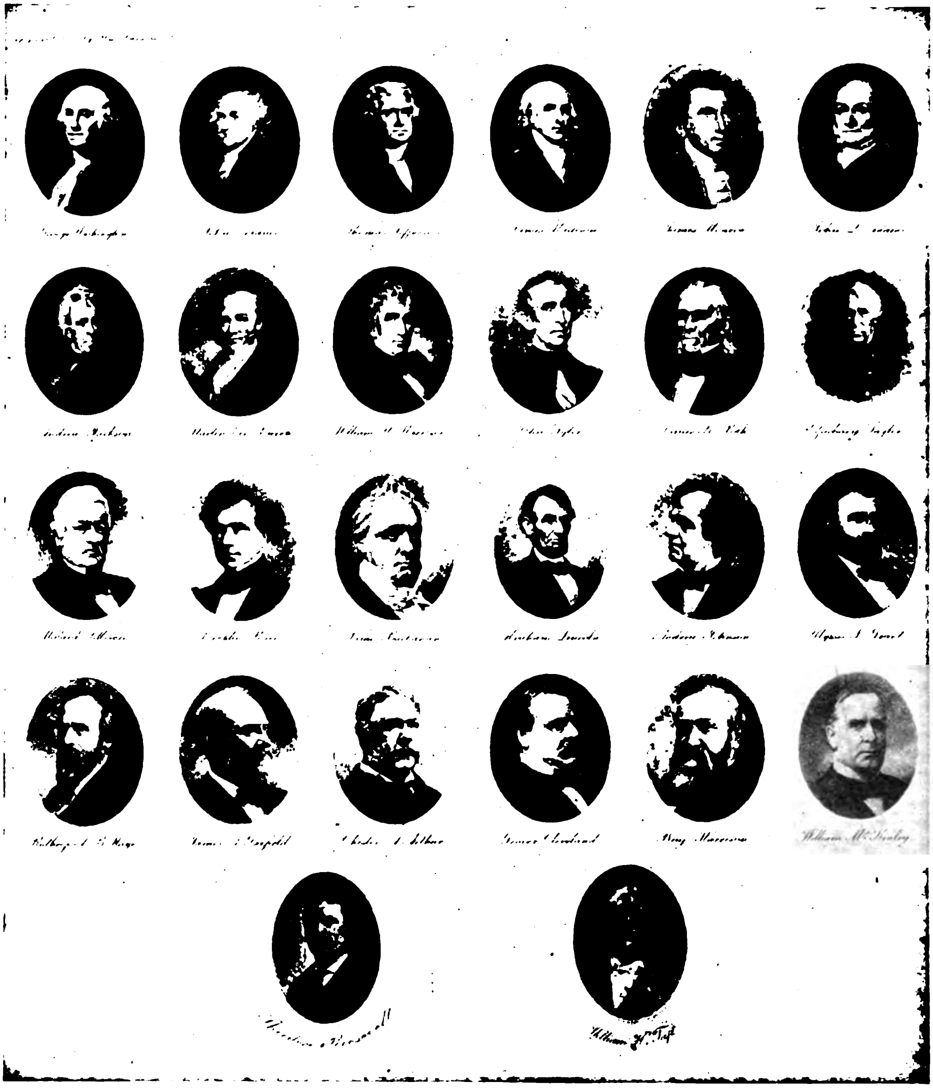


This picture shows us in a diagram the wonderful way in which the electric shocks travel through the ether. The wireless waves radiate in all directions, outwards and upwards, so that in less than one-sixtieth of a second a dot of the message, shown here as being sent from Poldhu, could be received in London, Norway, Berlin, America, or on any ship sailing on the Atlantic Ocean. It is to prevent everyone receiving everyone else's messages that the instruments are tuned. The message could also be received in airship, aeroplane, or balloon at thousands of miles above the clouds if men could get there. It is also believed that they descend into the earth.

This picture shows us, in another way, what we see above—how the wireless waves radiate, expanding evenly in true circles. The boy has thrown a stone into the river, and the waves flow outwards, getting fainter and fainter the farther they get from the spot where the shock occurred. The wireless waves are waves in the ether very like these water-waves, with this difference, that while the ripples of water travel only in a horizontal direction all round, and at a slow-rate, the wireless waves travel at a very rapid pace, and in all directions. A better illustration of how these electric waves travel is provided by the light from a lamp or candle. The light-waves move from the flame in every direction, and the wireless waves travel through the world in exactly the same way from the centre at which the message is sent off.

THE NEXT FAMILIAR THINGS ARE ON PAGE 3649

# PRESIDENTS OF THE UNITED STATES



Here are the twenty-six men who have held the great office of President of the United States since the beginning of the government in 1789. Under them the population has grown from about four million to more than ninety million, and the nation has become one of the strongest and wealthiest in the world. No king or emperor has more power than the President, but at the end of his term, or terms, he becomes a private citizen again, with no more rights than any other. While there is no law to prevent a man being continued in his office for life, it has grown to be the custom to elect no man for more than two terms of four years each, and only nine of the twenty-six had a second election Five succeeded to the office by the death of the President. These were Tyler, Fillmore, Johnson, Arthur and Roosevelt. The last named is the only one who was then elected for a term of his own. Up to this time all our Presidents have been born east of the Mississippi River, in the older states. Fifteen have been elected from three states, Virginia, New York and Ohio, and three lived in Tennessee at the time they were elected, though it is a curious fact that all of them were born in North Carolina. The census just taken shows such a wonderful growth of population and wealth in the West, that we need not be surprised to see a President elected from that region, which was almost uninhabited sixty or seventy years ago. On page 2419 you may learn more about our Presidents and the states from which they came.

By courtesy of William Clausen, New York.

## WHAT WE LEARN IN THIS ARTICLE

**IN other volumes of our book you learn the history of our land from the beginning, but there was so much to tell that we could not mention every event. Here you are given a list of the Presidents of the United States and are told the most important events which occurred during the term or terms of each of them. You will find it a very convenient storehouse of facts.**

# ADMINISTRATIONS OF THE PRESIDENTS

**GEORGE WASHINGTON, First President. (Two terms, 1789-1797)**

With the adoption of the Constitution and the organisation of a Republic came the election of the first president of the United States, George Washington. He served two terms,—from 1789 to 1793 and from 1793 to 1797,—but refused a third term of office. His administrations were periods of growth for the new nation, and the wisdom of President Washington kept peace throughout the land. During his first term of office, the United States arranged the national debt, thus establishing their credit among the nations of the world; and we adopted the decimal money system of dollars, dimes and cents.

The prosperity of the country was greatly increased by the invention of the cotton gin by Eli Whitney; its area was enlarged by Jay's treaty with England, and by a treaty with Spain; and the number of states in the Union was increased to sixteen, by the addition of Vermont (1791), Kentucky (1792), and Tennessee (1796).

**JOHN ADAMS, Federalist. Second President. (One term, 1797-1801)**

In 1797 John Adams of Massachusetts, who had been Vice-President under Washington, became President of the United States. During Washington's administration, the French had asked our assistance in their war against England, and now, in Adams' administration, the corrupt government of France threatened to fight us unless we bribed them with money, "plenty of money." A wave of indignation swept over the United States. Pinckney, our minister to France at that time, spoke for the nation: "Millions for defence," he said firmly, "but not one cent for tribute." Soon a short and irregular war opened between our country and France, the United States capturing two or three French battleships, but as soon as the French discovered that we were going to give them "plenty of bullets" instead of "plenty of money," they came to terms of peace.

Adams' administration was rather an unfortunate one for him, as, owing to the trouble occasioned by foreigners who tried to stir up American citizens to help them in their war against England, Congress passed two new laws called the Alien and Sedition Laws, providing punishment for foreigners who were bent upon mischief, and for all persons who spoke or wrote against the government. These laws were short-lived, and although it was never necessary to put the first into effect, yet they made President Adams so unpopular that when his term expired, he was not re-elected.

**THOMAS JEFFERSON, Republican. Third President. (Two terms, 1801-1809)**

Upon Adams' retirement, his Vice-President, Thomas Jefferson, was elected and served for two terms,—from 1801 to 1805, and from 1805 to 1809.

His administration was an eventful and prosperous one for our country. The pirates of Algiers and Tripoli, who for years had demanded tribute from

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our vessels, were completely subdued by our warships, so that we were troubled by them only once afterwards. In 1803 an immense tract of land, more than doubling the area of the United States, was obtained for us from France through the Louisiana Purchase, and was partly explored by Lewis and Clarke in 1804–05. In 1807 the first successful steamship, invented by Robert Fulton, sailed up the Hudson River. Ohio was also admitted to the Union in 1803.

### JAMES MADISON, Republican. Fourth President. (Two terms, 1809–1817)

James Madison was elected fourth president of the United States, and served two terms, but his administrations were stormy, owing to Indian troubles and to the fact that in 1812 the United States declared war against the English for stopping our ships on the high seas and taking from them sailors supposed to be of English birth. We were badly beaten on land, Washington was captured, the Capitol and the White House were burned, but we swept everything before us at sea. The last battle of the war was fought January 8, 1815, at New Orleans, where the British were completely put to rout, though a treaty of peace had already been signed, but the news had not reached America. This War of 1812 was, on the whole, a fortunate one, as it thoroughly established our rights upon the seas and forced the respect of all the European powers for the new country growing up in the West. During Madison's administration two new States, Louisiana (1812) and Indiana (1816), were added to the Union.

### JAMES MONROE, Fifth President. (Two terms, 1817–1825)

Our fifth president, James Monroe, had fought in the Revolution and had arranged the purchase of Louisiana, but he came to his administration when the peace of the War of 1812 had just been made, and in the following years the young republic advanced by leaps and bounds. Florida was purchased from Spain and made a territory of the United States; five new states,— Mississippi (1817), Illinois (1818), Alabama (1819), Maine (1820), and Missouri (1821), were added to the Union; a national road was built across the Alleghany Mountains to the Mississippi, and the people poured over the Alleghanies into the rich bottom lands in the Mississippi Valley. The "Monroe Doctrine," forbidding the further colonisation of North and South America by European powers, also came into existence during this administration.

During Monroe's first administration party feeling died down, and no candidate opposed him at the election in 1820. One elector, however, refused to vote for him, saying that no man except Washington should receive every vote.

In 1824, during Monroe's second term of office, we welcomed to our shores again the brave Frenchman, Lafayette, who had so loyally supported us in the terrible years of our Revolution.

He was greeted with tears of joy by his comrades of the war, and shouts of welcome by the people. Congress made him a rich gift of money in gratitude for his services, and when he returned to France, we sent him home in one of the finest warships of our navy.

### JOHN QUINCY ADAMS. Sixth President. (One term, 1825–1829)

While John Quincy Adams was president the Erie Canal from Albany, on the Hudson River, to Buffalo, on Lake Erie, was completed (1825), making travel to the West far cheaper and easier in every way. It also helped in building up cities and towns in the western part of New York State. A few years later, in 1830, the first railroad was built in the United States, and soon little engines drew coach-loads of passengers from one portion of the country to another, at a rate of speed which would be truly astonishing to the modern boy and girl, used to seeing the trees and telegraph poles spin by at the rate of fifty miles an hour. To-day the railroads of the United States would stretch several times about the globe. John Quincy Adams served but one term of office, and was not at all popular. During his administration, in 1826, the first American Temperance Society was formed.

### ANDREW JACKSON, Democrat. Seventh President. (Two terms, 1829–1837)

Andrew Jackson was one of the most truly beloved presidents of the United

States. He was elected in 1828 and served two terms of office. Not long after his inauguration a newspaper came into existence under the editorship of a young man named William Lloyd Garrison. It was called "The Liberator," and was in favour of freedom for the slaves in the South. This was thought a wild idea at the time and created a great stir of excitement through the country. About this time South Carolina, under the leadership of John C. Calhoun, objected to a law passed by Congress increasing the tax on all cotton and woollen goods imported from abroad, as the Southerners said they could clothe their slaves much cheaper on imported material than on material sold by manufacturers in the North. The people became so heated over the matter that war between South Carolina and the Union was only prevented by the firmness of President Jackson and by the wisdom of Henry Clay, who persuaded Congress to make the tax much lighter. The most of the Indians were removed to lands across the Mississippi River, but in some cases resisted by force. President Jackson opposed the United States Bank and helped to destroy it. During General Jackson's administration two new states were added to the Union, Arkansas (1836) and Michigan (1837), making twenty-six in all, thus doubling the number of the original thirteen states.

### MARTIN VAN BUREN, Democrat. Eighth President. (One term, 1837-1841)

Shortly after the election of President Van Buren, the wonderful progress of our young nation was interrupted for a space by hard times and money difficulties throughout the country. Immigrants began to crowd in from Europe, and labour became so cheap that for a time people found it hard to earn a living. But in the long run, however, the country was benefited by this influx of new blood. Towns were built up in the West, railroads started and great coal mines opened with the help of these labouring men from abroad, and gradually they became part of the big new land in which they had come to make their homes.

### WILLIAM HENRY HARRISON, Whig, Ninth President, and JOHN TYLER, Tenth President. (One term, 1841-1845)

President Van Buren only served one term and was followed by General Harrison, who had won the memorable victory over the Indians at Tippecanoe. His services had not been forgotten by the American people. With shouts and songs of "Tippecanoe and Tyler too," he was elected to the office of chief executive in 1840. But he lived only a few weeks to enjoy his position of honour, and John Tyler of Virginia, his vice-president, succeeded him in office. Times once more became prosperous under Tyler. The first telegraph instrument was invented by Professor Morse and a line constructed from Washington to Baltimore in 1844. Since then telegraph lines have been constructed over all the known world. During the last months of Tyler's administration a treaty annexing Texas was signed, but it was not admitted as a state until Polk's administration. Florida, however, was admitted the day before Tyler went out of office.

### JAMES K. POLK, Democrat. Eleventh President. (One term, 1845-1849)

James K. Polk, who served one term, came to this office in 1845, when the whole country was ringing with the cry, "Give us Oregon, or we will fight," for Great Britain claimed a part of that region, and for a while the two nations nearly came to blows over the matter. Finally it was settled by an agreement dividing Pacific territory between them.

In that same year, 1846, we declared war with Mexico over a strip of land which both that country and the State of Texas claimed to own. Every battle fought in the war we gained, and when the war closed a large tract of land was given us by Mexico, including California, Utah, Nevada and parts of New Mexico, Arizona, Colorado and Wyoming.

During Polk's administration three new states, Texas (1845), Iowa (1846), and Wisconsin (1848), joined the Union, making thirty States in all. Just before the War with Mexico closed, gold was discovered in California and there was a mad rush to the West, thus rapidly settling that part of the Pacific Coast.

**ZACHARY TAYLOR, Whig, Twelfth President, and MILLARD FILLMORE, Whig, Thirteenth President. (One term, 1849-1853)**

In 1848 General Taylor was elected our twelfth president and not long after his inauguration, California asked to come into the Union as a free state. The South, under the leadership of Calhoun, bitterly opposed this, wishing it to enter as a slave state. For some time Congress disputed the matter, but finally, after President Taylor had died, and Fillmore, his vice-president, had succeeded him, a plan of compromise proposed by Henry Clay was accepted, whereby in 1850 California was admitted as a free state, while the people of the territory given us by Mexico were to be allowed to choose for themselves whether they desired to come into the Union as free or slave states, and the slave trade was forbidden in the District of Columbia. Also a new Fugitive Slave Law was passed by Congress enabling slave holders to catch their runaway slaves in the North.

**FRANKLIN PIERCE, Democrat. Fourteenth President. (One term, 1853-1857)**

Our fourteenth president, Franklin Pierce, was inaugurated in 1853, and during his term of office the dispute between the North and South upon the slave question became more bitter than ever. Stephen A. Douglas, the wonderful orator of the West, persuaded Congress to make two territories of Kansas and Nebraska, giving them the right to choose whether they would have slaves or not. Immigrants from the North into Kansas wished to have it free; immigrants from the South determined to own slaves, and the result was that Kansas became a battlefield, with the two parties ready to fly at each other's throats on sight. So long and so disgraceful was the feud that the new territory became known as "Bleeding Kansas." Some territory known as the Gadsden Purchase was bought from Mexico and a treaty opening Japan to trade was also an important event of this administration.

**JAMES BUCHANAN, Democrat. Fifteenth President. (One term, 1857-1861)**

With the coming of James Buchanan to the presidency in 1857, the discussion over slavery became more bitter. Many states in the North refused to return runaway slaves and in fact helped to hide them and to send them to Canada. John Brown, who had been protesting against slavery in Kansas, made a raid upon Harper's Ferry, Virginia, captured the arsenal, which is a storehouse for guns, and attempted to excite the slaves to rise and kill the whites. He was captured, tried and hanged by the State of Virginia.

Three states, Minnesota (1858), Oregon (1859), and Kansas (1861), were admitted to the Union during this administration.

**ABRAHAM LINCOLN, Republican, Sixteenth President, and ANDREW JOHNSON, Republican, Seventeenth President. (Two terms, 1861-1869)**

In November, 1860, Abraham Lincoln, the Republican candidate, was elected the sixteenth president of the United States, and soon South Carolina seceded from the Union. Before Lincoln had been inaugurated Mississippi, Georgia, Florida, Alabama, Louisiana and Texas had followed her lead. When Lincoln came into office, in 1861, the country was ready for war, and action opened with the capture of Fort Sumter, April 14, 1861, by the Southerners. President Lincoln at once called for 75,000 men, and Virginia, Arkansas, Tennessee and North Carolina seceded.

The story of the war is told in another part of our book. It was practically ended by the surrender of the army of General Robert E. Lee at Appomattox, April 9, 1865. A few days later (April 14) all were shocked to hear that the President had been fatally wounded by John Wilkes Booth. West Virginia (1863) and Nevada (1864) became states.

Vice-President Andrew Johnson at once became president. He was not a popular man and in 1868 a number of the members of Congress attempted to remove him from office, but they did not succeed. After enduring several years of bad government the Southern States were received back into the Union and were once more allowed to send members to Congress. The freed negroes also were given the right to vote. The Alaskan territory was purchased by us from Russia for $7,200,000, thus adding a vast area to the United States;

and in the same year Nebraska entered the Union (1867).

### ULYSSES S. GRANT, Republican. Eighteenth President. (Two terms, 1869-1877)

When Johnson's term expired he was replaced in the presidency by the man who had led the Union troops to victory during the Civil War, General Ulysses S. Grant. He was inaugurated in 1869, as the eighteenth president of the United States. While Grant was president the first railroad running across the continent to the Pacific was completed, in 1869, and thousands travelled over its lines to settle in the great West. Three other events of public interest during Grant's administration were serious Indian troubles, including the massacre of General Custer and his men; the admission of Colorado to the Union (1876), and the holding of a World's Fair at Philadelphia in 1876 to show the wonderful growth of our young nation during the first hundred years of its existence.

### RUTHERFORD B. HAYES, Republican. Nineteenth President. (One term, 1877-1891)

The first disputed election for president in our history occurred in 1876. So close was the contest between Samuel J. Tilden, the Democratic candidate, and Mr. Hayes that a special body, known as the Electoral Commission, was appointed to settle the matter. It decided in favour of Mr. Hayes.

There were but two events of national importance that occurred during the administration of our nineteenth president, namely, the recall of the Union troops placed through the South, and the dredging of the Mississippi River clean of the mud that lay thick and deep in its broad mouth. This latter was of great advantage to the city of New Orleans, as it now enabled vessels to pass in and out of the river without trouble, and thus greatly assisted commerce.

### JAMES A. GARFIELD, Republican, Twentieth President, and CHESTER A. ARTHUR, Twenty-First President. (One term, 1881-1885)

We now come to James A. Garfield, who was elected in 1880. He had been in office but a few months when a man to whom he had refused to give a position in the government, shot him down in the railway station at Washington. Two months later he died and Vice-President Arthur became our twenty-first president. The terrible death of President Garfield turned the attention of the people to the regulation of government positions, and a law was passed taking many appointments out of the hands of the chief executive and compelling those trying to get government work to pass an examination first, thus protecting the president from private requests for places. President Arthur's administration, coming as it did some years after the Civil War, was one of great prosperity. Cotton industries, manufactures of all kinds and the opening of great iron mines throughout the country were among the "signs of the times." Postage on letters was reduced from three cents to two cents in 1883.

### GROVER CLEVELAND, Democrat. Twenty-second President. (One term, 1885-1889)

Grover Cleveland came to the presidency in 1885, as the twenty-second president. Two laws of the greatest importance were passed during his administration, namely: one regulating the counting of votes in the election of a president and another providing for the filling of the presidential chair in case of the death of both the president and vice-president. In 1886 the beautiful Statue of Liberty in New York Harbour was presented to the country by the French in token of the good will they felt toward our nation. Any night it may be seen, its flaming electric torch on high, guiding vessels coming up the harbour to the great metropolis of the "land of religious and personal freedom." A severe earthquake which did much damage in the South occurred in 1886.

### BENJAMIN HARRISON, Republican. Twenty-third President. (One term, 1889-1893)

With President Benjamin Harrison coming into office, the territory of Oklahoma was opened to white settlers in 1889. During 1889 Montana, Washington, North and South Dakota entered the Union, and Idaho and Wyoming were admitted the next year. With this marvellous growth of our nation, it was decided that we should enlarge our navy, so the United States built a number of steel warships, naming them after some of the states of the Union. Serious labour troubles also caused much loss of life.

### GROVER CLEVELAND, Democrat. (One term, 1893-1897.)

In 1893, very shortly after the second election of Grover Cleveland, a great World's Fair was opened in Chicago to celebrate the discovery of America by Columbus four hundred and one years before. About this time also there arose a dispute between England and the United States regarding the boundary between Venezuela and British Guiana, and for a time war was threatened. The matter was, however, referred to arbitration; that is, wise men were appointed to decide the matter, and there was no war. Before Cleveland retired from office another state, Utah, was added to the Union in 1896, so that the stars in our flag now numbered forty-five.

### WILLIAM McKINLEY, Republican, Twenty-fourth President. THEODORE ROOSEVELT, Republican, Twenty-fifth President. (Two terms, 1897-1905)

In President McKinley's administration the country was again plunged into war. Spain had been treating the people in Cuba in a most heartless way, and in consequence a war broke out between Spain and her possession. So many Cubans died a terrible death from starvation, and as Cuba, being really a part of the American continents, came under the Monroe Doctrine, the United States stepped in and said that Spain should not oppress her colony. We sent the battleship Maine down to Havana to inquire into the conditions. While lying in the harbour of that city she was blown up and many of her officers and sailors were killed. The Spaniards were suspected of the act. President McKinley at once said that the war in Cuba must stop, and Congress declared the people of Cuba free and independent, telling Spain to remove her soldiers from that territory. Spain refused and war opened between Spain and the United States.

After a few months the war came to an end by Spain giving Cuba her freedom, and selling the Philippines, Porto Rico and another small island to the United States for $20,000,000.

Before the end of the war with Spain, we also came into possession of the Hawaiian Islands. But in this time of our growing prosperity, our President was assassinated, and Vice-President Roosevelt became the twenty-sixth president of the United States in 1901. In 1903 a wonderful piece of work was completed by the American people, namely, the laying of a cable from San Francisco to the Hawaiian Islands, and from thence to Manila. On the fourth of July of that year, President Roosevelt flashed a message around the world.

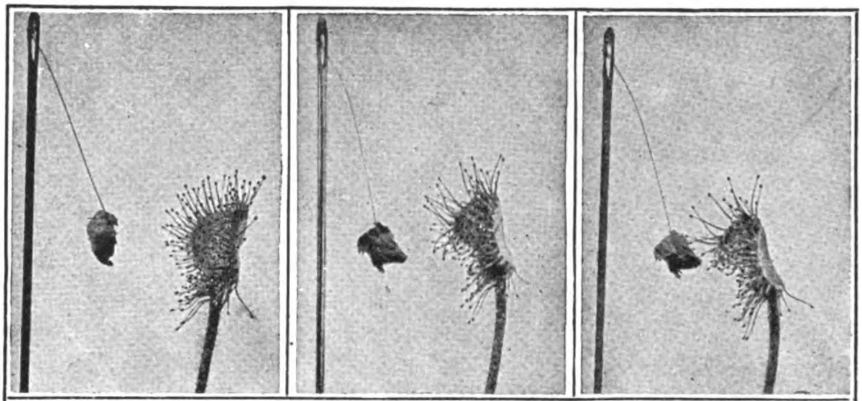
In President Roosevelt's first administration the United States bought the rights of the French in the Panama Canal, a right for which we paid $40,000,000. The great World's Exhibition was opened at St. Louis on April 30, 1904, to celebrate the purchase of the Louisiana territory by President Jefferson. One hundred years previous that country had been a vast wilderness. Now it was thronging with the life of Western civilisation. So quickly did things take root and spring into vigorous being in the New World.

### THEODORE ROOSEVELT, Republican. Twenty-fifth President. (1905-1909)

President Roosevelt was elected in 1904 after serving as president for more than three years of the term for which President McKinley had been chosen. During this term great progress was made in the government of our colonial dependencies, and a war against the waste of our natural resources was declared. You will hear a great deal more about the "conservation of natural resources" in the future. At the end of his term President Roosevelt sailed to Africa and spent over a year shooting big game and collecting specimens for the Smithsonian Institute.

### WILLIAM H. TAFT, Republican. Twenty-sixth President. (1909-)

At the election of 1908, William H. Taft, who had been the first governor of the Philippines and had served as Secretary of War in President Roosevelt's Cabinet, was chosen. So far his administration has been exceedingly peaceful, and we have no very striking events to relate. Work on the Panama Canal has been proceeding very rapidly. You can read of his administration in the newspapers every day.



The sundew, a carnivorous plant, seems to know when food is near, for if meat be placed close to it, the plant slowly reaches out for it, as shown in these photographs taken at intervals of forty minutes.

# DOES A PLANT EAT?

CONTINUED FROM 3438

In the answer to another question, on page 2797, we have seen that certain leaves of plants can tell the difference between light and dark, and this is a sort of seeing, though it is very different from our sight, and not nearly so useful. In this question we may remember, first, that trees are a kind of plant; and, second, that *feeling* means any kind of sensation, including the sensation due to light. So that really the answer is "Yes."

And, even if by *feel* we mean only the sensation of *touch*, the answer is "Yes" as regards many plants, that we call *sensitive plants*. Some of these are specially clever at feeling things, because they actually eat insects, and they require to know when an insect touches them. Plants of this kind are readily found growing wild in the United States, in Scotland, and in many other places. The leaf of the plant is covered with tiny sticky sensitive things looking like short hairs. If we touch the leaf with our finger, we see that it curls up. If a very small insect touches it, it is caught by the sticky stuff on the hairs, and the leaf quickly rolls up and catches it. So the insect dies, and the plant digests its dead body, and eats it. This is the simplest kind of what are called *carnivorous* or flesh-eating plants that are found in all parts of the world. Some of them make large traps, that close up and catch even strong insects. We know, then, that plants can see and can feel; but there is no proof that they can hear. Charles Darwin had the trombone played to a plant, and many other people have made experiments of a similar kind, but they all seem to show that plants do not hear.

### HOW FAR CAN WE SEE?

When we say that our eyes see, all we really mean is, that light has entered them, and has affected them. If that happens, we see. It does not matter whether the light has been produced by a match that someone has held just in front of our eye, or whether the light has come from a star so distant that its light took ten thousand years to reach us. In either case, if light enters our eye in sufficient quantity to affect it, we see. This is quite simple when we come to think of it, but most people are confused about this question because they do not ask it quite rightly, another proof of that saying that everything depends on putting the question rightly to Nature. We understand now that our eyes can see to any distance from which light can reach them. Of course, the question whether the light has travelled billions and billions of miles, or only half an inch, makes not the slightest difference to our eyes.

It is quite a distinct question at what distance our eyes can distinguish the details of a particular thing. This depends on a great many things, but it can be reckoned to some extent, and it is very important to do this for the case of different telescopes. We know that, if there were any building on the side of the moon next to us as large as the Capitol at Washington, it could be made out in our best telescopes.

### WHY CANNOT WE FLY IN THE AIR AS WE SWIM IN THE WATER?

This is a very just question, because the two problems of swimming and flying are exactly the same in principle. In both cases, the body is heavier than the thing around it, and the problem is, somehow or other, to prevent it from sinking. But, in the case of swimming, the thing around the body, or *medium*, as we call it, is much nearer the heaviness of the body itself than in the case of air, and so the task is much less difficult. It is still less difficult in sea-water than in fresh, because sea-water is heavier. It is possible, however, for an animal that is not a bird, and that is made on very much the same principles as ourselves, to fly; and that animal is the bat. The bat knows, so to speak, as the Wright Brothers know, that if we want to fly, we must expose a large surface to the air, so as to get all we can out of the supporting power of the air.

So the bat, that has fingers of the same pattern as our own, has made them enormously long, and has stretched a web between them, and, thus provided with two beautiful aeroplanes, it can fly. We really see the same thing, as regards swimming, in the case of many web-footed birds, web-footed frogs and newts, and other similar creatures.

### HOW IS IT THAT A BIRD CAN FLY WHEN IT IS HEAVIER THAN AIR?

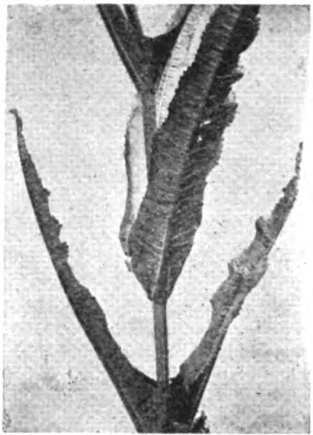
People who spend their lives in destroying the lives of other creatures know that, when a bird is shot, it falls; in other words, a dead bird obeys the force of gravitation exactly as a hailstone, or a raindrop, or a meteor must do. The force of gravitation is always acting even on the living bird. It is therefore plain that some force is produced that acts against the force of gravitation, balances it when the bird maintains its level in the air, or more than balances it when the bird rises in the air. This force, as we have seen, is produced by the life of the bird. It can be produced in other things that are not alive, as in a flying-machine, whether a real one, or one of the toy butterflies that we play with. In any case, there is produced a force that acts in the opposite direction to the force of gravitation, and is, for the time being, superior to it. We know that, in the case of the bird, the force is produced by burning the sugar in its muscles; in the case of the aeroplane, it is produced by burning the petrol in the engine; in the case of the toy butterfly, it was produced by burning the sugar in our muscles when we wound it up. Foolish people sometimes speak as if these were cases of defying one of Nature's laws. They are nothing of the sort. Gravitation goes on acting on the bird, whether the bird rises or falls. But, when the bird rises, a greater force is being opposed to the force of gravitation.

### IF THE EARTH IS SHRINKING, SHALL WE EVER BE TOPPLED OFF?

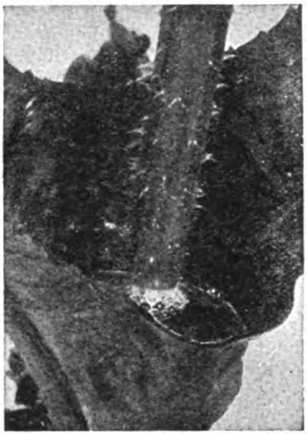
When the earth or anything else shrinks, the stuff, or matter, in it gets no less; it is merely packed more closely. What keeps us on the earth is its gravitation, and that depends upon the stuff in it. The stuff is there just the same, however much the earth shrinks, and the force of gravitation at the surface, and therefore upon us, will indeed be more powerful as the earth shrinks, simply because this must mean that we get nearer to the great mass of it.

There will be a limit in any case to the extent to which the earth shrinks, just as there is to the shrinking of other things. The more anything shrinks, the more resistance there is to its shrinking any more. When anything begins shrinking, we must imagine that there is plenty of room between its atoms, and, as it shrinks, they get nearer to each other; but soon there is less room between them, and the time will come when the force of the atoms, squeezing against each other, will resist the force

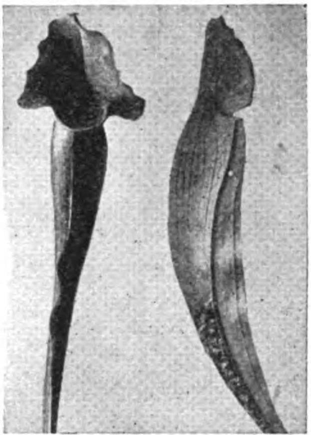
# PLANTS THAT CATCH AND EAT INSECTS



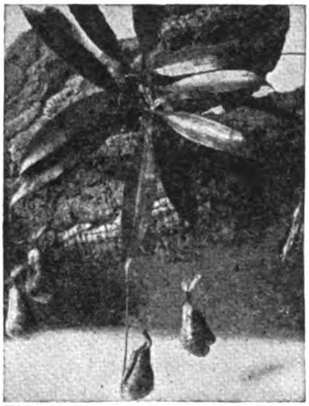
The teasel, that grows in the tangled corners of the fields and other waste places, has its leaves joined together at the base, forming a cup that collects the rain-water and drowns insects.



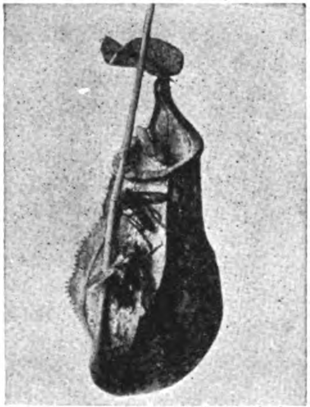
Here we have a closer view of the teasel's drowning-pot for insects. To what extent the teasel benefits by the insect soup that is formed after a shower, is not exactly known.



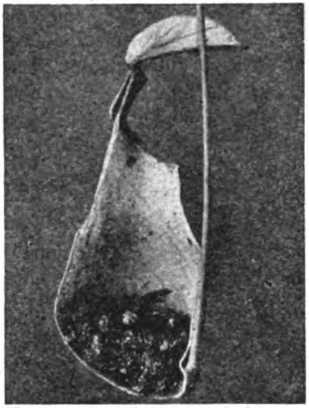
The sarracenia's leaves are like pitchers. They collect the rain-water and feed upon the insects that get drowned. The right-hand leaf here has been opened to show the insects.



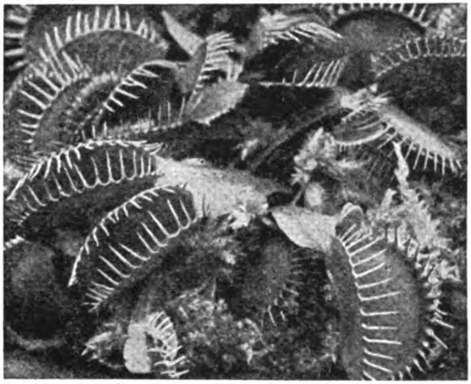
This is a nepenthes. Its pitchers hang on long stalks, and insects are attracted by their honey-glands and bright colours. Once inside, they slip down and are drowned.



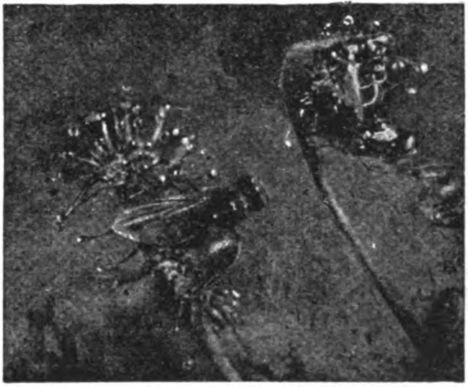
In this picture we see a single pitcher of the nepenthes with some insects about to enter. The pitcher has an ingenious lid on top, that opens only when the plant is fully grown.



Here we see the same pitcher cut open to show the dead insects inside. The plant digests them, for the pitcher produces digestive acids, just like an animal's stomach.



The Venus's fly-trap, shown here, was called "Nature's miracle" by Linnæus, the father of modern botany. If an insect alights upon a leaf, the leaf closes upon it like a spring trap in a few seconds, and digests the insect, taking, perhaps, a fortnight over the meal.



The English plant, the sundew, feeds upon insects. When a fly settles, it is held by a sticky juice that the plant produces, and the hairs, or tentacles, close round the insect and digest it. On the left we see a fly that has just settled, and on the right the fly half digested.

that is making the thing shrink. When the two forces balance one another, it will shrink no more. We see this at once if we watch any crowd gather ; it goes on shrinking until elbows begin to press against elbows, and then it stops.

### WHAT MAKES TREES TURN INTO COAL WHEN THEY SINK INTO THE GROUND?

It is not every kind of tree that turns into coal, and we all know that coal is of many different kinds. It is not yet quite easy to make out all the reasons why different kinds of coal differ. We have to reckon with many facts, such as the particular kind of plant from which the coal was made, the amount of pressure it has been subjected to, the temperature it has been kept at, the kind of salts that were in the water that has trickled through it, and so on.

But still, this question can be fully answered in general terms. We may say that the difference between the tree and coal is, that the tree consists of a great many elements and compounds, while coal consists mainly of the element carbon only. Another way of putting our question, then, would be, What makes everything but the carbon go ? The answer is, that the rest of the body of the tree is slowly oxidised, or burnt away, but the conditions which obtain in the ground are such, that while the rest is burnt away, the carbon is not, and so it remains and forms coal. We see, when we burn a candle, that carbon is more difficult than other things to burn away. We know what a lot of black smoke and soot is apt to come from a candle, or from a lamp. That is the carbon which we have not succeeded in burning away; but, certainly, we shall not find any unburnt hydrogen.

### WHAT IS PEAT AND HOW WAS IT MADE?

Peat, we may say, is half-way between trees and coal. It is made, of course, from vegetable matter, and we may find it in layers many feet thick. About one-seventh of the whole surface of Ireland is occupied by bogs in which the formation of peat has occurred, or is occurring. It is said that an inch or two of peat forms every year. We do not suppose that peat is made from just the same kind of plant as most of the coal that we know so well was made from, but still, the process that goes on is really the same. Peat varies a good deal, according to the extent to which part of it has been gradually oxidised away and the carbon left. On the average, about three-fifths of it consists of carbon. When dried, of course, it can be burnt.

### WHAT IS THE WILL-O'-THE-WISP?

There is a particular kind of gas that is produced from decaying vegetable matter in marshy water, and is called marsh-gas. This is made of carbon and hydrogen, and is readily capable of being burnt. As it is produced, it is slowly burnt in the air, and so gives rise to a light. The gas, as it burns, shares in the general movements of the air, and so, of course, the light seems to dance about. This is a thing that has long been observed. It has an old Latin name that we may often see in print—*ignis fatuus*. It is also sometimes called Jack-o'-lantern. We can understand how stories might be made up about this light cheating travellers and dragging them into the marsh, where, perhaps, they would fall and die. At one time it was supposed that there might be some kind of tiny insects that hover over marshes at night, and give out a faint light. We know, of course, that there are insects that give out light, like the fireflies, But it is now generally admitted that the slow burning of marsh-gas is the real cause of the will-o'-the-wisp.

### WHERE DOES INDIA-RUBBER COME FROM?

India-rubber is simply the sap or juice of certain trees and plants. Centuries ago, when Columbus discovered the island of Hayti, he found the people using balls of solid sap that they had taken from the trees, but he did not see that it was a product of any importance. It was not until the end of the eighteenth century that it was known in Europe.

It was first known under the name of elastic gum, and it was brought to us because it was found to be a good thing for rubbing out pencil-marks made on paper.

To-day, rubber manufacture is one of the most important trades in the world. Rubber is grown in various parts of Africa, in America, in Portugal, in British India, and in many other parts. Seeds of the best trees are taken every year to favourable climates, and, everywhere, the growth of the rubber-trees is extending. When the tree reaches its prime, the rubber-gatherers cut rings in its bark. Soon, the sap begins to flow from these openings, and trickles down into pots placed at the foot of the tree. A good tree gives about twenty gallons of juice, or forty pounds of rubber, in a season. Then it will go on growing again, heal the wounds in its bark, and be ready to be tapped in the next following season. When the rubber leaves the tree it looks like thin cream. It hardens on meeting the air, and, when solid, is sent to market.

### HOW IS INDIA-RUBBER PREPARED FOR USE?

In the factory, india-rubber undergoes what is called a vulcanising process. Sulphur is mixed with it, and the mixture is made very hot. Then it becomes more elastic, and very hard. That is what is needed for tires of bicycles, motors, and carriages; for hose-pipes, springs, buffers, gas and water pipes, doormats, dolls, machine-belting, waterproofs, cushions, beds, and so forth. Mixed with a larger quantity of sulphur, and made still more hot, the rubber becomes vulcanite, or ebonite, from which we make combs, pipe-stems, speaking-tubes, instruments that doctors use, telephone mouth-pieces, and other electrical appliances.

Rubber is needed for so many purposes that we can never get too much of it, and clever men are working, day after day, trying to discover how to make it. They can make sugar and indigo, and many other things that formerly they could get only from Nature, and they can make rubber, too. But the rubber that the clever chemists make costs so much that it is cheaper to buy that which grows in the forests across the seas. Some day men may be able to make it so cheaply that we shall not have to fear a rubber famine. Then tires and rubber dolls will be cheap, and perhaps we shall be able to have our streets paved with rubber, so putting an end to much of the noise of the traffic.

### COULD WE SEE WITHOUT THE BRAIN?

The sight is entirely under the control of the brain, and is not perfect at first. All little babies, especially during the first few weeks of their lives, squint a great deal, and often the mothers are alarmed. But there is really no reason for getting frightened about this. After all, it is the most natural thing in the world. The brain is wonderful beyond all other things in earth, or sea, or sky, but it must learn. The tiny little spot in the baby's brain that has twelve muscles to look after, six for each eyeball, can hardly be expected to manage such a team all at once. Yet, in only a few weeks of practice, even the tiny brain of a baby learns how to control all this wonderful living machinery. It can send just the right kind of command along its nerve to one muscle, a different command along another nerve to another muscle, still a different kind of command, that it shall relax and let the others pull, along yet another nerve to yet another muscle, and so on, in perfect harmony, with all the twelve, so that the two eyeballs may move up and down together, or to left and to right, or, what is more wonderful and difficult still, both to left and upwards together. We, all of us, do this thousands of times every day of our lives, and yet many people have never given it a thought.

### WHY DO WE SEE ONLY ONE THING WHEN WE LOOK AT IT WITH BOTH EYES?

The answer to this question can be guessed directly we make a very simple experiment on ourselves. Let us look at something with both eyes—say, at the outlines of the window-panes. Then let us press sideways with our finger on one eye, so as to push it forcibly a little way inwards or outwards. We shall find that we see double. This can only mean that, directly we interfere with the natural way in which the brain controls the movements of the two eyeballs, we see double.

Each eyeball has six little muscles attached to it, that pull it in the direction the brain desires; the nerves that run to the twelve muscles of the two eyeballs are all controlled by *one* little group of nerve-cells in the brain. The curtains at the backs of the two eyes have corresponding parts, so that images thrown on corresponding parts of the two curtains are *seen* by the brain as one image; but when the eyes are not properly worked together—as when we press on our eyeball—the two images of the thing we look at are not thrown on exactly corresponding parts of the two screens, or curtains, of the two eyes; and so we see two images of the thing instead of one. If we think of it, we shall understand how wonderful this is, for, when we look at something on our left or right, it must be that the outer part of one screen corresponds not to the outer but to the inner part of the screen in the other eye.

### WHY DO SOME PEOPLE NOT SEE STRAIGHT?

When the two eyes are not moved perfectly together, we say that the person squints; and if such a person *took notice* of what both eyes told him he would see everything double, because he would never get the two images of anything he looked at thrown upon the corresponding parts of the screens at the back of his two eyes. But, as a rule, such a person gets into the way of taking no notice of what he sees with one of his eyes, and of really using only the other. So he does not see double.

The commonest reason why people squint is, that one eye is perhaps short-sighted, and the short-sighted eye gives such blurred views of things compared with the other that the brain, so to speak, makes up its mind that it is not worth while to use that eye at all. So it simply gives up taking the trouble of moving that eye along with the other one, and so the person squints. The way to prevent this from happening is to use spectacles, with glasses of different shapes for the two eyes, so that their vision is made equal. Then, of course, the brain finds it well worth while to move both eyes together.

### HOW IS IT THAT GRAVITY DOES NOT PULL THE STARS TO THE EARTH?

Everywhere and always, gravity is pulling every atom of matter in the universe towards every other atom. If, therefore, there were no other force at work in the universe except gravity, all the matter in the universe—stars and sun and planets and moons, and everything else—would certainly and quickly be gathered together into one huge round ball. But what we are apt to forget is, that, while gravity is constantly working, other things are at work too, and what happens in this case, as in every other, is the result of the balance, the give-and-take, the interplay, as we say, between the forces that are at work.

One of the forces at work in the universe is the motion of the various moving things in it, and that motion is, of course, a force opposing gravity on all sides, except the gravity due to anything towards which the body is directly moving. It is the earth's motion, for instance, that prevents the earth from rushing into the sun; and the earth's actual path is the result of the compromise between the motion that is in the earth, and the sun's pull. It has been supposed, by some thinkers, that most or all of the motions in the universe must get wasted away in time; not that anything is ever lost, but that they get frittered away as heat. If this were to happen some day, then gravitation, being unopposed, must necessarily pull everything together, and form the great ball we spoke of above. But there are so many other forces at work in the universe than those we have already clearly found out that we must not make any positive prophecies.

### CAN THE WORLD GO ON IN ITS PRESENT FORM FOR EVER?

We are certain that, unless the sun should rush into another star, and make so much heat as to burn us all up—which is very unlikely—the earth will go on much as it is now for many ages to come; yet slow changes are always going on, and going on *in one direction*, that must lead to great results some day. The earth *must* be either getting cooler, or else using up the radium that keeps it warm; it is bound to become cold some day, as is the sun itself. That day may be far off—farther off than we are now from the time when the earth was formed—but it must come some time. Then there is evidence to show that the motion of the earth must be getting slower—though very slowly; and probably at last the earth will be drawn into the sun, and so end its independent history. Recent discoveries have made us form longer estimates of the time that these changes will take to happen; but it seems certain that they must happen some day.

### WHY WON'T A PENDULUM SWING FOR EVER?

This question seems to assume that we might expect a pendulum to swing for ever unless something stopped it, and that is what makes it so good a question. If a thing moves, something has moved it. If the moving thing stops, something has stopped it. So our question is this: As a moving thing, such as a pendulum, must swing for ever unless something stops it, what stops it?

The things that stop a pendulum are, first, the resistance of the air. That we can understand, if we think of a pendulum swinging in an ocean of water instead of an ocean of air. If we make a vacuum, as nearly as we can, by sucking the air out of a space, and then swing a pendulum in it, it will swing for a long time. Only one thing remains to stop it, and that is the rubbing, or friction, between the top of the pendulum and the thing it is hanging from. So now we know the two causes that stop a pendulum.

### WHAT MAKES THE FIELDS WHITE WITH MIST AT NIGHT IN THE HOT WEATHER?

The mist, of course, is water, and it is not water-vapour, or gas, but drops of liquid water. It is exactly the same as a cloud, and if we pass through a cloud in a balloon, it looks just the same as this kind of mist. The hotter the air is, the more water-vapour it can hold. If the air is made very hot by the sun in the daytime, and if there is much water near, and little wind, then the air, as the day goes on, comes to hold a very large quantity of water-vapour. This is a transparent gas, mixed with the other transparent gases that make the air, and so, of course, we cannot see it. But, as the sun sets, the air quickly gets cooler. Then it cannot hold as much water-vapour as it did before, and so a good deal of the water turns into liquid drops, and makes a mist, just like the mist our breath makes on a cold day. If there is much moisture in the ground, this mist naturally forms nearest the ground, and so looks like a sea of steam. It may be a very shallow sea round our legs, so that we can see clearly above it far away, but cannot see our own feet if we are walking through it.

This photograph shows a bank of mist filling a valley, and gradually enveloping a hill

### WHY DOES A PIECE OF IRON TURN RED WHEN IT IS HOT?

When iron turns red, this means, we know, that it is producing light of the particular kind that impresses our eyes as red, and we see the iron by this light. Of course, we see the iron when it is cold, but only by light reflected from its surface. If the cold iron be put in the dark, we cannot see it, but red-hot iron glows in the dark. The point is, then, that the red-hot iron shines by its own light—makes light of its own. Lumen is a Latin word for light, and so we say that the iron becomes luminous. The particular character of the light given out by the iron will depend upon how hot it is, for we know that if red-hot iron is heated it turns white. This fact about iron is common to most things, or, indeed, all things; when they are heated up to a certain point, they become luminous. Light, we know, is made of waves in the ether, and all we can say is, that the atoms of a hot thing move about so as to make those waves in the ether that we call light.

### WHY DOES A KETTLE NOT GET RED HOT WHEN IT IS HEATED?

If we have read the answer to the last question we shall be prepared to answer this one for ourselves; and the first thing that we shall notice is, that the question is not properly asked, for if we simply take a kettle and heat it, it *does* turn red hot. But what was meant, when this question was asked, was: How is it that the same kettle—which, of course, heated by itself would turn red hot—does not turn red hot when it is put on the fire, *after having been filled with water?*

Well, we know that the reason why a thing gives out light is, that it is hot. So it must be that, in some way, though we are applying heat to the kettle, it does not get hold of heat enough to make it luminous. The reason is, that water will hold more heat than any other thing we know, and that nothing is greedier of any heat in its neighbourhood. So the water takes the heat from the kettle, and does not allow the bottom of the kettle ever to get hotter than the temperature of boiling water. That is hotter than our fingers like, but it is much below the temperature at which iron becomes luminous.

### WHY IS IT THAT WE HAVE BONES IN OUR BODIES?

The first use of our bones is, by their strength and resistance, to form a supporting framework for our bodies, and prevent them from collapsing in a shapeless mass on the surface of the ground under the influence of the earth's gravitation; that is what would happen to a boneless man, if there could be such a person; and if we had both our legs broken, we should soon find how useful whole bones are in resisting the pull of the earth, which we could not resist in such a plight as that suggested. Even apart from the pull of the earth, our skeleton is necessary to hold the body in its shape; and so fishes, too, have bones. When we are eating a herring, we object to the bones, but if there were no bones there would be no herring. The second use of our bones is to furnish rigid bars on which our muscles can pull. One end of the muscle is attached to one bone, say, the bone of the upper arm, and the other end to another, such as one of the bones of the forearm, and then, when the muscle shortens, the joint between the bones is bent, and we can lift what is in the hand. Our muscles could not be the wonderful servants of our wills that they are if we had no bones.

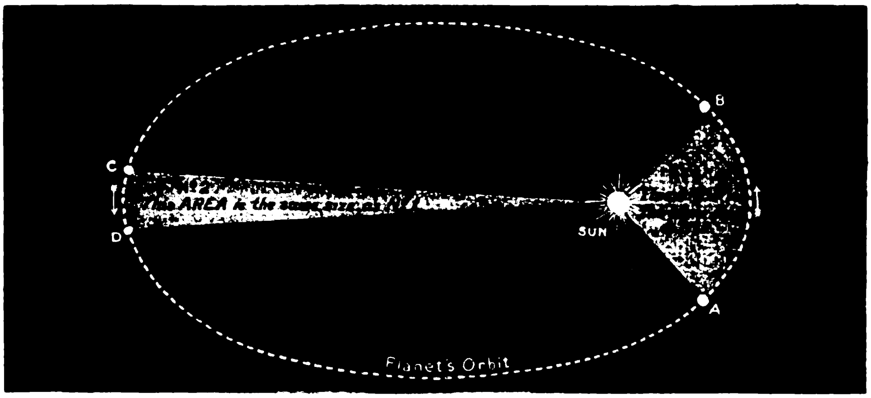
And, lastly, the red cells of our blood, without which we could not breathe, are made in the living marrow of most of our bones.

### WILL THE EARTH EVER SHRINK UP TO NOTHING?

We believe that, though everything in the universe is *changed*, nothing is ever destroyed and made into nothing. Almost the first fact men realised when they began to think—and to-day we are surer of it than ever—is that nothing is made out of nothing, and that nothing is reduced to nothing. The answer to the question must therefore be, No. If the earth were ever to cease to exist, it would be either because it fell into some other world, such as the sun, or because it kept on losing bits of itself until nothing was left. It could never become nothing by shrinking, as we see directly we remember what shrinking is.

Shrinking means getting smaller in size, or bulk, or volume. If a thing gets packed tighter together, it shrinks; it gets less in size, but it does not get any less in the amount of stuff in it. A metal ball shrinks when it is cooled, and expands when it is heated; but there is just the same amount of stuff in it. It merely gets denser—smaller, but *heavier in proportion to its size.* That is exactly what is happening to the earth as it cools. It is losing to the outer world hardly any of the stuff that makes it; it is daily gaining, by the stuff of all the shooting stars and dust from space that fall upon it. Apart from this, it is simply getting more tightly packed together. We may have heard stories about things shrinking away to nothing, but they are absurd. That cannot happen, unless the thing is gradually losing more and more of itself to the world around it. If that went on it would come to nothing; but that would not be shrinking.

The next Questions are on page 3687.



This diagram explains Kepler's law that led to the discovery of gravitation. A planet moves along the boundaries of equal areas in equal times, and so moves from A to B in the same time as from C to D.

# WHY THINGS MOVE

CONTINUED FROM 3470

NEWTON'S three laws are simply called the laws of motion. Kepler's three laws are called the laws of planetary motion; they deal not with motion in general, but with the movements of the planets. With immense labour, continued for many years, Kepler showed that all the planets which were then known moved according to certain laws, their speeds depending upon their distance from the sun, and so forth. The calculations and statements of these laws are rather complicated, and do not matter for us now. There was no obvious connection between the three laws; there were simply three facts about planetary motion that were found by him and put down one after the other. But when the still more glorious mind of Newton considered these facts, he saw that there lay hid in them the law of gravitation, upon which they all depend.

This law is responsible for perhaps the greater part of all the motion in the world. It is the law, as Herbert Spencer said, "by which the universe is balanced." If the different bodies that make up the universe were still, and were balanced, at rest, by the law of gravitation, that would be wonderful enough. But they are all in motion, and are yet controlled. This great law explains the motions we see in the heavens on one great principle, which applies equally to the motion of an apple let fall from a tree, and of the moon round the earth, and the earth and the other planets round the sun. But, said a great philosopher, we shall never be able to tell whether gravitation exists among the stars. We have now proved, however, that it does exist there also. We can tell the mass and the distance of stars that have never been seen, by the motion which they produce through gravitation in other stars that we can see.

No question of distance, then, destroys the working of this mighty law that every portion of matter in the universe attracts every other portion of matter with a power that depends, in an absolutely regular way, upon the amount of stuff which is being attracted, and upon the distance. This law would alone suffice, if necessary, to make the universe really one.

> All things by immortal power,
> Near or far,
> Hiddenly
> To each other linkèd are,
> That thou canst not stir a flower
> Without troubling of a star.

This is how one of our poets has expressed it, and his lines make it beautifully clear for us. The same poet, Francis Thompson, has said the same thing, still more beautifully:

> I do think my tread,
> Stirring the blossoms in the meadow-grass,
> Flickers the unwithering stars.

Now, of course, a very serious question for us is whether this great law can be at all changed or altered in its working by anything. We have evidence, as we have seen, that distance does not destroy it at all. But if we come back to earth and study the working of gravitation in the laboratory, can we affect it there? Many workers, for some years past, have devoted their whole lives to this question.

For instance, if we put something in between two other bodies, do we interfere with the gravitation between them—as if gravitation were something like light, which could be cut off—or does gravitation take no notice of obstacles? The answer to this, as the result of the most careful study, is that the gravitation between two bodies is exactly the same, their consequent weight and motion, or tendency to motion, being absolutely unaltered by the presence or absence of any obstacle of any kind between them.

### THE GREAT FORCE OF GRAVITATION THAT NOTHING WE KNOW CAN STOP

Whether through air, or through water, or through the ether of space alone, whether through intervening blocks of granite, or anything else, the power of gravitation is neither more nor less. If no distance and no obstacles interfere with gravitation, what would be the result of heat? If we take a thing that has a certain weight owing to the earth's pull for it, and its pull for the earth, and if we examine that same thing, first when it has been made fifty times colder than ice by being plunged in liquid air, and then when it has been made white hot, we find that the influence on the force of gravitation is nothing.

At least, we may put it this way. If we lift this book up in our hands from the table—say, six inches—we increase its distance from the centre of the earth. The book is lighter because the force of gravitation regularly lessens as the distance increases, though no distance will prevent it from working. Now, this difference in the weight of the book, due to its having been lifted six inches, is, of course, extremely slight. But in the newest experiments that have been made on gravitation, we are able to say that if, for instance, heat produced a difference in gravitation as great as the tiny difference produced by lifting the book from the table, we should have detected it. Most people will agree that if tremendous changes in temperature do not affect gravitation even to this extent, probably they do not affect it at all.

### ATOMS OF MATTER THAT WEIGH THE SAME WHETHER THEY ARE BOUND OR FREE

We have failed to abolish gravitation by distance; we have failed to block it by any obstacle; we cannot affect it by temperature; but what will happen if we take certain weights of two elements, like oxygen and hydrogen, and then combine them to make water? In other words, does chemical combination, or, of course, the opposite, which we call decomposition, affect gravitation? Do all the atoms of two different things weigh exactly the same, no matter whether they are independent of each other, or whether they are powerfully bound to each other, as they are in the case of water? The answer to this question is that chemical combination and decomposition have no more effect on gravitation than anything else has.

Other ways of trying to affect gravitation have been experimented with. They have all signally failed. We know of nothing that will cause this force to turn one hair's breadth either way from its appointed course. As Sir Joseph Thompson, one of the greatest of living authorities, has lately said, there seems to be no way of getting hold of gravitation. If we could once get our hands on it, we could do anything, but no method that has ever been tried has enabled us to modify it at all. Most people do not in the least understand what this means, however.

### A WELL-KNOWN MAN WHO TRIED TO DEFY THE LAW OF GRAVITATION

In a celebrated discussion last century, a very well-known man declared that he could defy the law of gravitation by holding an apple in his hand and preventing it from falling; but he was opposing force with force, and as long as the law of gravitation acted, he had to pay his price every moment for holding up the apple. Exactly the same applies to flying-machines. The force of gravitation is always acting, and from moment to moment the flier, like the bird, has to balance this force by some other acting in the opposite direction. The bird gets this force by burning the sugar in its muscles; the aeroplane gets it by burning the petrol in its engines.

### STRANGE THINGS THAT WOULD HAPPEN IF WE COULD CONTROL GRAVITATION

But suppose for a moment that in some way we could abolish gravitation, or get hold of it, or cut it off by a screen, then everything would be utterly different. There would be no problem in flying. Neither the bird nor the aeroplane would require to burn any fuel, except just the little amount required to overcome the resistance of the air. There would be nothing to pull the bird or the aeroplane downwards, and an apple released from the hand would not fall until we gave it a smart tap downwards. But one might go on for pages describing the endless extraordinary results that would follow if we could control gravitation. That time may come.

At present, however, not only can we not control it, but we cannot begin to understand it. We can measure it to a nicety, but as to how it acts we know nothing. There are at least twenty-four theories on the subject, and, as Sir Joseph Thompson has said, any one of them may be true; but just because we cannot influence gravitation in any way, we can test none of the theories. There are signs, however, that by working at the problems of electricity we shall ere long be able to go farther than before in this study.

### A BOY WHO HELPED THE WORLD BY WATCHING A LAMP SWING IN A CHURCH

At present, however, about 250 years after the discovery of gravitation, we can only say that while we have proved the truth of Newton's law, and its independence of every kind of condition that we can imagine, we know no more of the cause of gravitation than he did, and he knew nothing at all.

It was right to begin with Newton's laws of motion, and then to mention Kepler's laws of planetary motion, as they led up to Newton's great law of gravitation; but we must not forget to do honour to the real beginner of all these inquiries. This was the "starry Galileo," whom we all think of as an astronomer. He was, indeed, one of the greatest of astronomers. But most of his astronomical discoveries depended upon that ingenious mind which enabled him to invent the telescope, and those qualities of mind enabled him also to invent many experiments, so important as to make it true that "the science of motion began to exist with Galileo."

There is a splendid bronze lamp which hangs to-day, as it did in Galileo's time, from the roof of the cathedral at Pisa, and if we watch it we notice that it swings. Watching it at the age of nineteen, Galileo put a finger of one hand on the pulse of the other wrist, and, using this natural clock, he found that always, whether the lamp was making large swings or small, each swing or vibration took exactly the same time as any other. This was a most important discovery in the science of motion, and fifty years later Galileo put it to practical use by making a clock that depended on the constant swing of a pendulum.

### WHY THE PENDULUM SWINGS TO AND FRO, AND THE LAW THAT GOVERNS IT

It is worth our while to notice one or two things about the swing of a pendulum. First, there is Galileo's great discovery about the constancy of the rate for any particular pendulum; second, we must ask ourselves where the motion comes from. When the pendulum hangs still, the bob of the pendulum is as near the centre of the earth as it can get. Gravitation is therefore satisfied, and does nothing. But if we start the pendulum swinging, either by pushing it or by lifting it to one side and letting it go, then it starts moving.

Why? If we tie a weight to the end of a piece of string and hold the string in our hand, we can study this for ourselves. We see at once that when the bob of the pendulum is at one end of its swing, gravitation demands that it shall fall. In falling it obeys the law of falling bodies, which we shall study in a moment, moving faster and faster, until it reaches its lowest point, but it does not stop there, as we might expect. It does not stop because, in falling, it has come to contain power or energy or motion, and this is sufficient to carry it up again on the other side against the pull of the earth, but always more and more slowly, because it is doing work against the earth's pull, and therefore losing power. So at last it stops, and then the same thing happens again.

The power in the pendulum is the power that was put into it when it was pushed or lifted. It is not there when the pendulum is at rest, and it has not come from nowhere. The least touch is sufficient to start it swinging, and we may ask ourselves what becomes of that little portion of power that was put into it when it was touched. Now, nothing is lost, and if the pendulum stops swinging, no matter how little the swing ever was, we must account for the power that started it. It goes just as the power goes in a cricket-ball or a curling stone; it goes in friction where the pendulum is hung, and it goes in the resistance of the air. If, then, we could make a pendulum so hung that there was no friction, and if we could swing that pendulum in empty space, instead of in a heavy ocean, which the air really is, it would swing for ever. The power put into it would have no occasion to leak away, and so would remain.

### THE WONDERFUL MACHINERY OF YOUR BODY, WHICH NEVER STOPS IN HEALTH

Let us not suppose, however, that this is what is meant by perpetual motion. Directly we asked that pendulum to do any work by turning a wheel or resisting a little air, or anything else, then the power in it would leak away, and it would come to a stop.

Perpetual motion is a phrase which is always used for a certain idea, but few phrases could be worse to express what it means. A healthy child is a case of perpetual motion, and, indeed, whether we are old or young, asleep or awake, parts of our bodies are always moving. So far is perpetual motion from being impossible, that, indeed, the more we learn, the more we find that everything is moving—perhaps even that which we call matter is simply a kind of motion of something. It is almost a question whether there is anything in the world to study except motion, and yet we must have heard it said that perpetual motion is impossible. We should understand what we really mean when we use this phrase. What is impossible is to get something out of nothing, and that is what so-called perpetual motion machines all try to do. For hundreds of years past people have been trying to make machines that would do work for ever without being wound up or without having anything burnt inside them.

### A MACHINE THAT NO MAN WILL EVER BE ABLE TO MAKE

More than a hundred years ago now, the Paris Academy of Sciences decided that it would take no farther notice in future of any accounts of perpetual motion machines sent to it. At first sight that seems very wrong, because science must always be willing to listen to new things. But it is really quite right, because we know now that no one will ever make a perpetual motion machine. The man who did that would be a Creator.

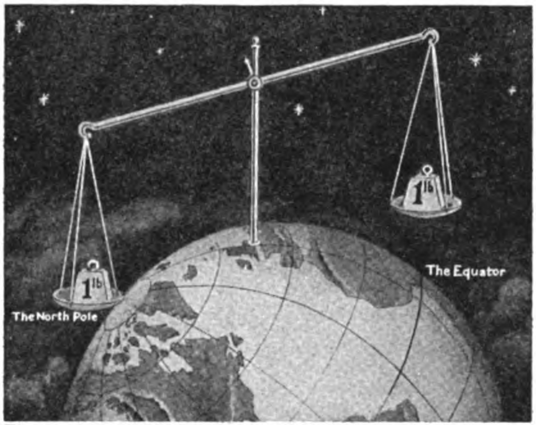
If power is to be used, it must come from somewhere; if work is done, someone or something must do it. This is true even of the atoms of radium, as it is of everything else. More than that, it is strictly, rigidly true of our own bodies, and of the bodies of all living things. They are a million times more marvellous than any machine that was ever made. Parts of them will work continuously for, perhaps, as long as a hundred years; these machines can repair themselves without stopping; but they are not perpetual motion machines in the sense that this phrase means.

For every heart-beat, for every time that we raise an arm or an eyelid, a certain amount of work has been done, a certain quantity of matter has been moved through a certain distance at a certain speed, and if we know what these figures are, it can be calculated exactly how much carbon, probably in sugar, had to be burnt up in the body in order to do that work.

### WHY WE MUST BE FED WITH POWER IF WE ARE TO SPEND POWER

If we were perpetual motion machines we could live without food. And the whole point and meaning of the fact that we and all living creatures have to take food, is that we are not perpetual motion machines, but, like every other machine on earth, must be fed with power if we are to spend power. It was long supposed that living creatures were exceptions to this great law, which, as we see, is really the law of the conservation of energy. We now know that this is not so, and that all living creatures, however wonderful they may be, and however different from things around them, are yet parts of the universal whole, and subject to the same laws. In every generation there are people who will not believe this, and who propose, either by the use of a living creature, or by some kind of machine, to make something out of nothing, but they have always failed, and always must fail.

Now we may go back to another great discovery of Galileo, about which we read on page 303, and we shall see how its meaning fits in with what we have learnt about work. By dropping balls of different weights from the leaning tower at Pisa, Galileo showed that they all reach the ground at the same time. It had been believed for about two thousand years, on the authority of a great Greek thinker, Aristotle, that a ball weighing ten pounds would reach the ground when a ball weighing five pounds would only have reached half-way. In all that time, so curious is the way in which people used to take things for granted, no one until Galileo had really asked Nature what the truth was.



**The nearer anything is to the centre of the earth, the heavier it is. If it were possible to erect a gigantic pair of scales in England and to put a one-pound weight in each pan, one hanging over the Equator and the other over the North Pole, the latter would drop, because it is 26 miles nearer the centre of the earth.**

But we must understand this. Surely a big ball, acting upon the earth, and acted upon by the earth, has more power than a little one? Surely we would rather be struck by a small hailstone than by a big meteorite? Surely where there is more power at work there should be greater speed? The answer is yes, there is more power at work, but there is more work to do, for there is more matter to move. The bigger the stone, the greater the power in proportion to the size of the stone; but the amount of work to be done in moving the stone increases in the same proportion, and so all bodies falling under the influence of gravitation fall at the same speed, and for any body whatever, for every second that it falls, its speed is increased in the same degree as in any other case.

Now we shall say that, after all, this is simply not true, because, as everyone knows, a feather takes longer to fall than a stone. But if we could imagine the air swept away, the feather would fall like the stone. This can be proved. We can take a long tube, remove the air from it—or, at any rate, remove quite enough for our purpose—and then let go, say, a bullet and a feather at the same moment from the top of the tube. We find that they reach the bottom together. That was a great discovery, and here is yet another that Galileo made. Aristotle taught that there were two things, weight and lightness; weight or gravity made things fall, and lightness or levity made them rise. Things that had the principle of gravity in them, like a bullet, would fall, and things that had the principle of levity in them, like hot air, would rise, according to Aristotle. Galileo showed that this was untrue. Everything in the universe has gravity in it, just because the law of gravitation applies to all matter everywhere. There is no such thing as a principle of lightness, or levity. Hot air rises, a balloon rises, a cork floats, not because these things have no weight in them, but simply because they have less weight in them than the things around them have, and so the things around them fall in beneath them, so to speak, and push them up.

But the most wonderful thing about Galileo was that he really saw for himself, and without anyone working before to help him, what Newton and the great workers of the nineteenth century proved. He saw that whenever there is motion, there is force, power, or energy at work. This idea of force as involved in all motion was new to Galileo, and it is the foundation of the whole science of motion. The proper name for the science of motion is dynamics, which is the Greek for force.

### ENERGY THAT IS NEVER CREATED AND CAN NEVER BE DESTROYED

The truth is that no one before Galileo seems to have seen that causes must have effects, and effects causes; that big causes must have big effects, and big effects big causes. So, wherever there is much motion, there is a proportionate cause at work. Galileo, of course, wrote in Latin, and used the Latin word *vis*, which means force, and Newton also wrote in Latin, and used the same word; but last century an Englishman, Dr. Thomas Young, began to use the word energy. And we say now that wherever there is motion, there is energy; that this energy is never created and never destroyed, but eternally transformed. These great ideas really date from the mind of Galileo, who actually worked out for himself in a rough way all of Newton's laws of motion. It is very interesting, however, that though both Galileo and Newton must have had in their minds the idea of the conservation of energy, neither of them stated it in so many words, and this was left for some German men of genius in the nineteenth century.

Energy is energy wherever it is, and in whatever form it is; but it has different forms, and two of these must be understood. The words describing them are certainly rather long, but they are not difficult to understand. When a thing is moving, we say that it has in it energy of motion. The proper name for this, taking the Greek word that means motion, is *kinetic* energy.

### THE TWO KINDS OF ENERGY THAT ARE SEEN IN THE SWINGING PENDULUM

There is no difficulty about this. When the bob of the pendulum swings downwards, faster from moment to moment, it is gathering kinetic energy, or energy of motion. Now, the other kind of energy is energy that does not show itself at the moment in anything, but the power or potency of it is there—*potentia* is Latin for power. It is therefore called potential energy. Now, throughout the world we can constantly see potential energy turning into kinetic energy, and *vice versâ*. The pendulum is a most beautiful illustration of this. When we pushed or raised the bob of the pendulum, its motion upwards showed kinetic energy; when it ceased moving upwards any farther, that motion was not lost, but was stored up in the bob of the pendulum as potential energy. It did not move, but it had within itself the power to move.

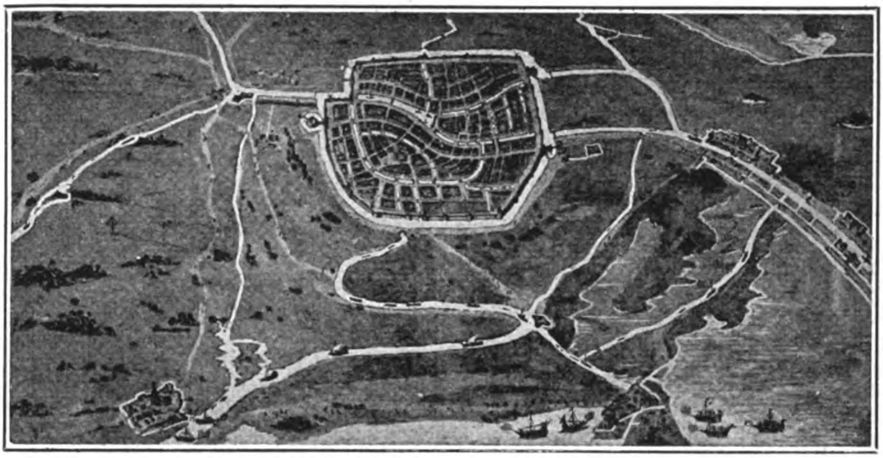
Then, when we let it go, the potential energy was changed into kinetic energy, as its motion proved. This kinetic energy enabled the pendulum to rise again after it had reached its lowest point. And now, at every moment, as the pendulum rises, it moves more slowly; its energy of motion, or kinetic energy, is being changed, though not lost, and when the pendulum reaches its highest point on the other side, all the kinetic energy has been changed into potential energy; and so this transformation backwards and forwards goes on as the pendulum swings.

### HOW MEN ARE LEARNING TO GET ENERGY FROM THE SUNSHINE

But we can learn from this still more about the changes of energy. When we pushed or lifted the bob of the pendulum, where did that kinetic energy come from? We have already learnt that the living body did not create it; our muscles made this energy of motion out of the potential energy existing in the sugar stored up in the muscles and derived from the food. This kind of potential energy, existing in sugar and other chemical things that can be burnt, is sometimes called chemical energy; but it is a kind of potential energy, and can be changed into energy of motion just as in the case of the bob of the pendulum when it is at its highest point.

But where did that potential energy in the sugar come from? Did the plant which made that sugar create that energy? That cannot be, we know. The plant made that potential energy out of the energy of motion, or kinetic energy, of the sunlight which streamed upon it. And we are now learning that that kinetic energy of sunlight probably came in greatest part from the potential energy stored up in the atoms of the sun.

The next part of this is on page 3669.



# HOW THE SEA SAVED HOLLAND

CONTINUED FROM 3472

Set in the midst of pastures, gardens, and orchards, with the Rhine running through the streets in many channels, Leyden, of which we see a plan on this page, was, in May, 1574, indeed a beautiful city. But the whole country was disturbed by the Spaniards, who were trying to force their religion on the Protestant Netherlanders. The people of Leyden would not submit, so an army under Valdez was sent to besiege the town. Encouraged in their resistance by the Prince of Orange, the brave little garrison shut the gates of the city, and the inhabitants were put on a strict allowance of food.

Now, Holland is below the level of the sea, which is only kept back, as we read on page 3456, by great dykes. The prince sought means to relieve the besieged; but, with the Spaniards all around the town and along the coast, there seemed but one way. He could not send ships to Leyden by sea, but he could send the sea to Leyden, and let the ocean drive away the Spaniards. He would pierce the dykes, open the sluices, and so save Holland. The people were willing, and said: "Better a drowned land than a lost land."

And so, in August of that year, the dykes on the coast were burst, and the waters crept down over the country towards the starving city. The Spanish army watched the water rise higher and higher between the dykes, first with surprise, then with alarm. A Dutch fleet of 200 vessels was fitted out and sent towards the city, which was, however, so well protected that it could not be reached for several weeks.

First a strong dyke, the Landscheiding, five miles from the city, was captured and pierced. The boats sailed through the openings, but the next dyke was found still one foot above the water, and when that was breached, the water beyond was too shallow to carry the boats, and they could only advance through a canal which was well guarded by the Spaniards. Alas for starving Leyden! The brave little fleet was repulsed, for the wind blew the waters back from the city.

On September 8, however, a gale arose from the north-west, and blew for three days, driving the waters nearer to the walls. Then the Spaniards retreated, as the waves, carrying the boats, advanced. Another long delay, due to an easterly wind, and yet the patient citizens, gaunt, feeble, racked by fever and pestilence, refused to yield. Some of them reproached the burgomaster for not yielding, but his courage and patriotism did not fail, and he answered: "I know that we shall starve to death if we are not soon relieved; but starvation is preferable to the dishonoured death which is the only alternative. My life is at your disposal; but expect no surrender so long as I remain alive."

The people gained courage from his words; a dove flew into the city bearing a message of hope, and, on October 1, a gale blew the waters close up to the walls. On the flood floated the relieving fleet, and there was a sharp encounter with the Spaniards, whose boats were sunk. Now the fleet was within a few hundred yards, and the men, jumping out, shouldered the boats through the shallows. There remained but one more fort of the besiegers to be taken. At dead of night the citizens watched lights come out from it and flit across the water.

In the morning a boy was seen at the top frantically waving his cap. He was a Dutch boy, and had seen the Spaniards escape. So the fort was entered, and the fleet swept alongside the quays throwing bread to the starving people. Then men, women, and children went to the cathedral, and thanked God for their deliverance, and, as a monument of their gratitude, they next year founded the famous Leyden University.

# THE CLIMB UP THE CAPITOL HILL

We read, elsewhere, how the beautiful city of Rome was taken and plundered by the Gauls. A story of one of the bravest Roman citizens who lived at that time stands out in the history of that terrible disaster. When Rome was besieged, one of her ablest generals was away from the city, for he had been falsely accused of taking more than his share of the plunder at the capture of Veii, a neighbouring city.

Angry and disgusted with the treatment he had received, Camillus had taken up his abode at Ardea. By his ability, he saved this city from destruction by the invading Gauls. When the Romans heard of this exploit they repented, saying: "If only our brave Camillus were here, he might save our city also from the dreadful Brennus." So they sent a message, begging Camillus to return and help them. But Camillus, who was a proud, haughty man, refused, saying that he was only an exile, and would need a decree from the Senate before he returned to Rome.

Now, the senators who were still alive were in the besieged Capitol, which stands high up on the Capitoline Hill, and could not be reached without passing through the Gallic lines; but a patriotic young Roman, Pontius Cominius, offered to undertake the mission.

Dressed as a peasant, and with corks about his neck to keep his head above water, he plunged, one dark night, into the Tiber, and drifted down to the base of the Capitoline Hill. Now came the dangerous part of the venture, for Cominius had to climb up to the Capitol. He clung to grass, vine-stem, or point of rock as he dragged his body up the steep ascent, using his bare feet to aid him, and all the time keeping a sharp look-out for any Gaul on the watch, until at last he reached the rampart. There he called out his name, and was immediately surrounded by his eager countrymen. He told them that Camillus only waited the Senate's decree to come to their help. Camillus was quickly voted Dictator by the few senators who were left, and Cominius at once returned down the hill, luckily escaping without being seen by the Gallic sentinels.

Though he got safely away, the Gauls noticed that someone had disturbed the creepers, and that stones were displaced, so they planned a night attack on the Capitol. When they carried this out they found the sentinel asleep, but the cackling of the sacred geese in the Capitol warned the citizens, and they repulsed the attack. However, the besieged were starving, and were driven to treat with Brennus. While the ransom was being discussed, Camillus, with his soldiers, appeared on the scene, and exclaimed: "It is with iron, not gold, that Romans guard their country."

Soon after, the Gauls were driven away, and the Romans acknowledged that they owed their rescue to the brave Cominius, who, at the risk of his own life, had brought Camillus to them.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3659

# The Child's Book of POETRY

## A FABLE TOLD IN VERSE

AMONG the many lesser poets who, while attempting only the treatment of homely subjects, have yet left us poems which, though in form no better than the commonest rhyme, have said something that will be long remembered, Mary Howitt has a place of some eminence. We have already had occasion to speak of Mrs. Howitt and her husband, William Howitt, in reading other poems of theirs printed in this book. They deserve to be remembered for the healthy and elevating character of all they wrote. None of Mary Howitt's verses for young people is better known than "The Spider and the Fly," with which almost every American boy and girl is bound to make acquaintance. Like many another of the poems given in our book, this is a fable in rhyme. The story itself is a very old one, the idea of the spider luring the silly fly to destruction having been a popular illustration of the danger of listening to flattery, long before Mrs. Howitt gave it this versified form.

# THE SPIDER AND THE FLY

CONTINUED FROM 3422

"WILL you walk into my parlour?" said the spider to the fly.
"'Tis the prettiest little parlour that ever you did spy;
The way into my parlour is up a winding stair,
And I've many curious things to show when you are there."
"Oh, no, no," said the little fly, "to ask me is in vain,
For who goes up your winding stair can ne'er come down again!"

"I'm sure you must be weary, dear, with soaring up so high;
Will you rest upon my little bed?" said the spider to the fly.
"There are pretty curtains drawn around; the sheets are fine and thin,
And if you like to rest a while, I'll snugly tuck you in!"
"Oh, no, no," said the little fly, "for I've often heard it said,
They never, never wake again, who sleep upon your bed!"

Said the cunning spider to the fly: "Dear friend, what can I do
To prove the warm affection I've always felt for you?
I have within my pantry good store of all that's nice;
I'm sure you're very welcome—will you please to take a slice?"
"Oh, no, no," said the little fly, "kind sir, that cannot be;
I've heard what's in your pantry, and I do not wish to see!"

"Sweet creature!" said the spider, "you're witty and you're wise,
How handsome are your gauzy wings, how brilliant are your eyes!
I've a little looking-glass upon my parlour shelf,
If you'll step in one moment, dear, you shall behold yourself."
"I thank you, gentle sir," she said, "for what you're pleased to say,
And bidding you good-morning now, I'll call another day."

The spider turned him round about, and went into his den,
For well he knew the silly fly would soon come back again;
So he wove a subtle web, in a little corner sly,
And set his table ready, to dine upon the fly.

Then he came out to his door again, and merrily did sing:
"Come hither, hither, pretty fly, with the pearl and silver wing;
Your robes are green and purple—there's a crest upon your head;
Your eyes are like the diamond bright, but mine are dull as lead!"

Alas, alas! how very soon this silly little fly,
Hearing his wily, flattering words, came slowly flitting by;
With buzzing wings she hung aloft, then near and nearer drew,
Thinking only of her brilliant eyes, and green and purple hue—
Thinking only of her crested head—poor, foolish thing! At last
Up jumped the cunning spider, and fiercely held her fast.
He dragged her up his winding stair, into his dismal den,
Within his little parlour—but she ne'er came out again!

And now, dear little children, who may this story read,
To idle, silly, flattering words, I pray you ne'er give heed;
Unto an evil counsellor, close heart and ear and eye,
And take a lesson from this tale of the spider and the fly.

## FIDELITY

Among the numberless poems in which the fidelity of the dog is celebrated, this, by William Wordsworth, takes a high place. There are many instances of dogs that have shown as great fidelity to their masters as the shepherd's dog here described, and they are all worthy of the poet's praise.

A BARKING sound the shepherd hears,
  A cry as of a dog or fox;
He halts, and searches with his eye
Among the scattered rocks:
And now at distance can discern
A stirring in a brake of fern;
And instantly a dog is seen,
Glancing through that covert green.

The dog is not of mountain breed;
Its motions, too, are wild and shy;
With something, as the shepherd thinks,
Unusual in its cry:
Nor is there anyone in sight
All round, in hollow or on height;
Nor shout, nor whistle strikes his ear:
What is the creature doing here?

It was a cove, a huge recess,
That keeps, till June, December's snow;
A lofty precipice in front,
A silent tarn below;
Far in the bosom of Helvellyn,
Remote from public road or dwelling,
Pathway, or cultivated land;
From trace of human foot or hand.

There, sometimes, doth a leaping fish
Send through the tarn a lonely cheer;
The crags repeat the raven's croak,
In symphony austere;
Thither the rainbow comes, the cloud—
And mists that spread the flying shroud,
And sunbeams; and the sounding blast,
That if it could would hurry past;
But that enormous barrier holds it fast.

Not free from boding thoughts, awhile
The shepherd stood; then makes his way
O'er rocks and stones, following the dog
As quickly as he may;
Nor far had gone before he found
A human skeleton on the ground:
The appalled discoverer with a sigh
Looks round to learn the history.

From those abrupt and perilous rocks
The man had fallen, that place of fear!
At length upon the shepherd's mind
It breaks, and all is clear:
He instantly recalled the name,
And who he was, and whence he came;
Remembered, too, the very day
On which the traveller passed that way.

But hear a wonder for whose sake
This lamentable tale I tell!
A lasting monument of words
This wonder merits well.
The dog, which still was hovering nigh,
Repeating the same timid cry,
This dog had been through three months' space
A dweller in that savage place.

Yes, proof was plain that since the day
When this ill-fated traveller died,
The dog had watch'd about the spot,
Or by his master's side:
How nourished there through that long time,
He knows who gave that love sublime;
And gave that strength of feeling great,
  Above all human estimate.

## SHE IS FAR FROM THE LAND

Thomas Moore, the celebrated Irish poet, is likely to be remembered in time to come chiefly for his exquisite songs, of which "The Minstrel Boy," on page 642, is one of the best examples. The following is another of his tuneful lyrics. "The Island of Sorrow" referred to in the last line is, of course, the poet's native land of Ireland.

SHE is far from the land where her young hero sleeps,
  And lovers are round her, sighing;
But coldly she turns from their gaze, and weeps,
  For her heart in his grave is lying.

She sings the wild song of her dear native plains,
  Every note which he loved awaking;
Ah, little they think who delight in her strains
  How the heart of the minstrel is breaking.

He had lived for his love, for his country he died,
  They were all that to life had entwined him;
Nor soon shall the tears of his country be dried,
  Nor long will his love stay behind him.

Oh, make her a grave where the sunbeams rest,
  When they promise a glorious morrow;
They'll shine o'er her sleep like a smile from the West,
  From her own loved island of sorrow.

## THE OLD FAMILIAR FACES

Charles Lamb is one of the most attractive characters in the whole history of English literature. His fame rests chiefly on his charming essays, as he gained no great distinction in poetry. Together with his sister Mary, he wrote a number of poems for children, several of which appear in our pages, though the following lines in blank verse cannot be described as juvenile poetry. The sentiment which they convey, however, is so human and so universal—the pathos of looking in vain for "the old familiar faces" when one has lived through the long years, lingering after one's friends have all departed—that they really appeal to "children of all ages."

I HAVE had playmates, I have had companions,
  In my days of childhood, in my joyful schooldays—
All, all are gone, the old familiar faces.

I have been laughing, I have been carousing,
Drinking late, sitting late, with my bosom cronies—
All, all are gone, the old familiar faces.

I loved a love once, fairest among women,
Closed are her doors on me, I must not see her—
All, all are gone, the old familiar faces.

I have a friend, a kinder friend has no man.
Like an ingrate, I left my friend abruptly;
Left him, to muse on the old familiar faces.

Ghost-like, I paced round the haunts of my childhood.
Earth seem'd a desert I was bound to traverse,
Seeking to find the old familiar faces.

Friend of my bosom, thou more than a brother,
Why wert not thou born in my father's dwelling?
So might we talk of the old familiar faces.

How some they have died, and some they have left me,
And some are taken from me; all are departed;
All, all are gone, the old familiar faces.

## CUDDLE DOON

One of the finest poems of childhood, "Cuddle Doon," derives not a little of its beauty from the quaint Scots tongue in which it is written. It is just a simple picture of what happens every night in millions of homes. Many of the words are peculiar to Scotland and the north of England. "Muckle faught" means much noise or disturbance; "waukrife" means wakeful; "hap" is to cover up; "kittlin'" is the Scots for tickling; to "steek" the door is to shut and bolt it; to "straik each croon" is to stroke each head or crown; "quaten doon" is to quieten down; "ilka ane" means each one, and "pow" is, of course, a head, or, more correctly, the top of the head. Alexander Anderson, whose fame rests almost entirely on this one gem of Scottish poetry, was a working man employed on the railway in Scotland, and his verses were written over the signature of "Surfaceman." Born at Kirkconnel, Dumfriesshire, on April 30, 1845, he eventually became, thanks to his poetic gifts and his self-application to literary studies, librarian to Edinburgh University, where he remained until his death, in 1909.

The bairnies cuddle doon at nicht
  Wi' muckle faught an' din;
"Oh, try and sleep, ye waukrife rogues,
  Your faither's comin' in."
They never heed a word I speak;
  I try to gie a froon;
But aye I hap them up an' cry,
  "Oh, bairnies, cuddle doon!"

Wee Jamie wi' the curly heid—
  He aye sleeps next the wa'—
Bangs up an' cries, "I want a piece,'
  The rascal starts them a'.
I rin an' fetch them pieces, drinks,
  They stop awee the soun',
Then draw the blankets up an' cry,
  "Noo, weanies, cuddle doon!"

But ere five minutes gang, wee Rab
  Cries out, frae 'neath the claes,
"Mither, mak' Tam gie ower at ance,
  He's kittlin' wi' his taes."
The mischief's in that Tam for tricks,
  He'd bother half the toon;
But aye I hap them up an' cry,
  "Oh, bairnies, cuddle doon!"

At length they hear their faither's fit,
  An', as he steeks the door,
They turn their faces to the wa',
  While Tam pretends to snore.
"Hae a' the weans been gude?" he asks,
  As he pits aff his shoon;
"The bairnies, John, are in their beds,
  An' lang since cuddled doon."

An' just afore we bed oorsel's,
  We look at our wee lambs,
Tam has his airm roun' wee Rab's neck,
  And Rab his airm roun' Tam's.
I lift wee Jamie up the bed,
  An' as I straik each croon,
I whisper, till my heart fills up,
  "Oh, bairnies, cuddle doon!"

The bairnies cuddle doon at nicht,
  Wi' mirth that's dear to me;
But soon the big warl's cark an' care
  Will quaten doon their glee.
Yet, come what will to ilka ane,
  May He who rules aboon,
Aye whisper, though their pows be bald,
  "Oh, bairnies, cuddle doon!"

## COMMON NATURES

Aaron Hill, the writer of these lines, was born in 1685, and died in 1750. He was famous in his day as a poet and playwright, but has long since been forgotten except for such occasional quotations from his writings as the little poem we give here.

Tender-handed stroke a nettle,
  And it stings you for your pains;
Grasp it like a man of mettle,
  And it soft as silk remains.

'Tis the same with common natures:
  Use them kindly, they rebel;
But be rough as nutmeg-graters,
  And the rogues obey you well.

## DISPUTE BETWEEN NOSE AND EYES

William Cowper in this quaint little poem would seem to be having a sly dig at the lawyers, for there can be no doubt that the decision of Baron Ear is distinctly absurd, being based on the arguments of Lawyer Tongue, who, having used all his skill in pleading the case of Nose, had, unfortunately, left himself without a good case for Eyes.

Between Nose and Eyes a strange contest arose,
  The spectacles set them unhappily wrong;
The point in dispute was, as all the world knows,
  To which the said spectacles ought to belong.

So Tongue was the lawyer, and argued the cause
  With a great deal of skill, and a wig full of learning,
While chief Baron Ear sat to balance the laws,
  So famed for his talent in nicely discerning.

"In behalf of the Nose, it will quickly appear,
  And your lordship," he said, "will undoubtedly find
That the Nose has had spectacles always in wear,
  Which amounts to possession—time out of mind."

Then holding the spectacles up to the court—
  "Your lordship observes they are made with a straddle,
As wide as the ridge of the Nose is—in short,
  Designed to sit close to it, just like a saddle.

"Again, would your lordship a moment suppose
  ('Tis a case that has happened, and may be again),
That the visage or countenance had not a Nose,
  Pray who would, or who could, wear spectacles then?

"On the whole it appears, and my argument shows,
  With a reasoning the court will never condemn,
That the spectacles plainly were made for the Nose,
  And the Nose was as plainly intended for them."

Then shifting his side (as a lawyer knows how)
  He pleaded again in behalf of the Eyes;
But what were his arguments few people know,
  For the court did not think they were equally wise.

So his lordship decreed with a grave, solemn tone,
  Decisive and clear, without one "if" or "but,"
That, whenever the Nose put his spectacles on,
  By daylight, or candle-light, Eyes should be shut.

## THE CASTLE-BUILDER

Famous among the writers of France is Jean de Lafontaine, born 1621, died 1695. Although an idle and good-for-nothing sort of fellow, he was a writer of great and original gifts. He is best remembered for his fables in verse, which have often been translated into English, and a typical example of which is here given. Every boy and girl is, no doubt, familiar with the "moral" of this fable, which is just the old saying, "Never count your chicks before they're hatched."

It happened on a summer's day,
A country lass as fresh as May,
Decked in a wholesome russet gown,
Was going to the market town;
So blithe her looks, so simply clean,
You'd take her for a May-day queen;
Though for her garland, says the tale,
Her head sustained a loaded pail.
As on her way she passed along,
She hummed the fragments of a song;
She did not hum for want of thought—
Quite pleased with what to sale she brought,
She reckoned by her own account,
When all was sold, the whole amount.
Thus she—" In time this little ware
May turn to great account with care:
My milk being sold for—so and so,
I'll buy some eggs as markets go,
And set them; at the time I fix,
These eggs will bring as many chicks;
I'll spare no pains to feed them well;
They'll bring vast profit when they sell.
With this, I'll buy a little pig,
And when 'tis grown up fat and big,
I'll sell it, whether boar or sow,
And with the money buy a cow:
This cow will surely have a calf,
And there the profit's half in half;
Besides, there's butter, milk, and cheese,
To keep the market when I please:
All which I'll sell, and buy a farm,
Then of sweethearts have a swarm.
Oh, then for ribands, gloves, and rings!
Ay, more than twenty pretty things—
One brings me this, another that,
And I shall have—I know not what!"
Fired with the thought, the sanguine lass,
Of what was thus to come to pass.
Her heart beat strong; she gave a bound,
And down came milkpail on the ground:
Eggs, fowl, pig, hog (ah, well-a-day!)
Cow, calf, and farm—all swam away!

## BEAUTIFUL THINGS

This little poem by Ellen P. Allerton tells us that true beauty lies in something more than loveliness of form and face.

Beautiful faces are those that wear—
It matters little if dark or fair—
Whole-souled honesty printed there.

Beautiful eyes are those that show,
Like crystal panes, where hearth-fires glow,
Beautiful thoughts that burn below.

Beautiful lips are those whose words
Leap from the heart like songs of birds,
Yet whose utterance prudence girds.

Beautiful hands are those that do
Work that is earnest, and brave, and true,
Moment by moment, the long day through.

Beautiful feet are those that go
On kindly ministries to and fro,
Down lowliest ways, if God wills it so.

Beautiful shoulders are those that bear
Ceaseless burdens of homely care,
With patient grace and daily prayer.

Beautiful lives are those that bless—
Silent rivers of happiness,
Whose hidden fountains but few may guess.

Beautiful twilight at set of sun;
Beautiful goal, with race well won;
Beautiful rest, with work well done.

Beautiful graves, where grasses creep,
Where brown leaves fall, where drifts lie deep
Over worn-out hands—oh, beautiful sleep!

## WHAT BOBBIE WOULD LIKE

By permission of Mr. Frederic E. Weatherly we are able to read here these pretty verses from the pen of that famous song-writer, who, although he has written so much for the grown-ups, takes pleasure every now and then in turning his pen to write of childhood and children's thoughts.

I'd like to be a farmer,
With lots of stacks and mows,
And fowls and pigs, and carts and gigs,
And four-and-twenty cows.
I'd drive them all to market,
On summer mornings fine;
"Oh, come and buy," I'd stand and cry,
"Buy, buy, good masters mine!"
But if they would not buy them,
It would not give me pain;
I'd simply say: "Fair sirs, good-day!"
And drive them home again.

I wish I were a farmer,
With lots of lambs and sheep,
I'd run and play with them all day,
Until we went to sleep.
I'd take the wool to market
On summer mornings fine—
"Oh, come and buy," I'd stand and cry,
"Buy, buy, good masters mine!"
But if they would not buy my wool,
It would not cause me pain,
I'd come and say: "Dear sheep, good-day,
Here is your wool again."

And if they could not put it on,
I'd put it on myself;
And all the rest, when I was drest,
I'd lay upon the shelf.
For when the winter days come round,
And all the world is cold,
I know full well my wool will sell
For all its weight in gold.
And so I'll be a farmer,
Right happy in my lot,
And he who cares may buy my wares,
And other folk need not!

## THE CAGED BIRD

These lines are by William Lisle Bowles, a clergyman and poet of great distinction in his day, whose poems were admired by such great writers as Coleridge and Wordsworth. His works are now little read, and are familiar only to literary students. He was born in 1762 and died in 1850.

Oh, who would keep a little bird confined
When cowslip bells are nodding in the wind,
When every hedge as with "good-morrow" rings,
And, heard from wood to wood, the blackbird sings?
Oh, who would keep a little bird confined
In his cold wiry prison?—Let him fly,
And hear him sing: "How sweet is liberty!"

# LITTLE VERSES FOR VERY LITTLE PEOPLE

**The writing of nursery rhymes is by no means so easy as one might imagine. Perhaps that is why so few good rhymes, which are really worth calling nursery rhymes, are written nowadays. When people think things are easy to do, they are apt to neglect them, or to do them in a slipshod way. But Miss Laurence Alma-Tadema, who is a daughter of Sir Lawrence Alma-Tadema, the celebrated painter, has wisely thought it worth while to write nursery rhymes well, and, as a result, we have had many charming little verses of this kind from her pen. A selection from these is given on this page and the next. Like all that she has written, they have real musical movement in them, and, indeed, many of her poems for little folk have been set to music with great success.**

## MARCH MEADOWS

### A Lark

Lark-bird, lark-bird soaring high,
Are you never weary?
When you reach the empty sky,
Are the clouds not dreary?
Don't you sometimes long to be
A silent goldfish in the sea?

Goldfish, goldfish diving deep,
Are you never sad, say?
When you feel the cold waves creep,
Are you really glad, say?
Don't you sometimes long to sing
And be a lark-bird on the wing?

### Lambs

O little lambs! the month is cold,
The sky is very gray;
You shiver in the misty grass
And bleat all the winds that pass;
Wait! when I'm big—some day—
I'll build a roof to every fold.

But now that I am small, I'll pray
At mother's knee for you;
Perhaps the angels with their wings
Will come and warm you, little things;
I'm sure that, if God knew,
He'd let the lambs be born in May.

## A TWILIGHT SONG

Baby moon, 'tis time for bed,
Owlet leaves his nest now;
Hide your little horned head
In the twilight west now;
When you're old and round and bright
You shall stay and shine all night.

Baby girl is going, too,
In her bed to creep now;
She is little, just like you,
Time it is to sleep now;
When she's old and tired and wise,
She'll be glad to close her eyes.

## THE NESTING HOUR

Robin-friend has gone to bed,
Little wing to hide his head—
Mother's bird must slumber, too,
Just as baby robins do—
When the stars begin to rise,
Birds and babies close their eyes.

## PLAYGROUNDS

In summer I am very glad
We children are so small,
For we can see a thousand things
That men can't see at all.

They don't know much about the moss
And all the stones they pass;
They never lie and play among
The forests in the grass.

They walk about a long way off;
And, when we're at the sea,
Let father stoop as best he can
He can't find things like me.

But, when the snow is on the ground
And all the puddles freeze,
I wish that I were very tall,
High up above the trees.

## THE NEW PELISSE

Baby's got a new pelisse,
Very soft and very neat—
Like a lammy in her fleece
She's all white from head to feet.

Thirty lambs each gave a curl,
Mother sewed them, stitch by stitch—
All to clothe a baby-girl:
Don't you think she's very rich?

## THE LITTLE SISTER

### Bath-time

Baby's got no legs at all;
They're soft and pinky, crumpled things.
If he stood up he'd only fall;
But then, you see, he's used to wings.

### Bed-time

Baby, baby, bye,
Close your little eye!
When the dark begins to creep,
Tiny-wees must go to sleep.

Lammy, lammy, lie,
I am seven, I;
Little boys must sleep and wait,
If they want their bed-time late.

Fidgy, fidgy, fie,
There's no need to cry!
Soon you'll never dress in white,
But sit up working half the night.

# IF NO ONE EVER MARRIES ME

If no one ever marries me—
  And I don't see why they should;
For nurse says I'm not pretty,
  And I'm seldom very good—

If no one ever marries me,
  I shan't mind very much;
I shall buy a squirrel in a cage,
  And a little rabbit hutch.

I shall have a cottage near a wood,
  And a pony of my own,
And a little lamb quite neat and clean
  That I can take to town.

And when I'm getting really old,
  At twenty-eight or nine,
I shall buy a little orphan girl
  And bring her up as mine.

# KING BABY ON HIS THRONE

King Baby on his throne
  Sits reigning O, sits reigning O!
King Baby on his throne
Sits reigning all alone.

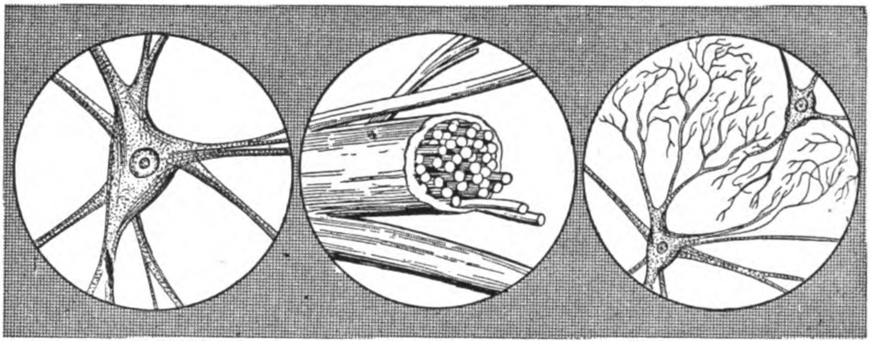
His throne is mother's knee,
  So tender O, so tender O!
His throne is mother's knee,
Where none may sit but he.

His crown it is of gold,
  So curly O, so curly O!
His crown it is of gold,
In shining tendrils rolled.

His kingdom is my heart,
  So loyal O, so loyal O!
His kingdom is my heart,
His own in every part.

Divine are all his laws,
  So simple O, so simple O!
Divine are all his laws,
With love for end and cause.

King Baby on his throne
  Sits reigning O, sits reigning O!
King Baby on his throne
Sits reigning all alone.



In the left-hand picture, showing a nerve-cell magnified, we see the nucleus and nerve-fibres. These fibres may intertwine with those of another cell, as seen in the right-hand picture, but they never unite. The middle picture shows a bundle of nerve-fibres in their sheath, with smaller bundles branching off.

# A FOREST OF NERVES WITHIN US

CONTINUED FROM 3320

If we feel gently at the back of the elbow, rather towards the inner side, we find a thing that feels like a sort of cord, and if we squeeze it or knock it accidentally, we discover that it is what we call the "funny-bone." It is a nerve, and therefore belongs to the most marvellous of all marvellous things. If we take a nerve and look at it, we find that it is just a cord made up of tiny threads which are called fibres. It is these fibres that are the real nerves. The big cord is simply a bundle of them travelling part of their journey in each other's company.

A nerve-fibre is a thing which is probably not to be found anywhere in the vegetable world, but these things begin to appear quite low in the scale of the animal world, and their importance and number become greater and greater as we ascend. There is no part of the body that has not nerves supplied to it, and there is no part of the body that does not suffer in some way or another if the nerves running to it be damaged or cut.

When we examine a nerve-fibre, we find that it is a very long thread, usually surrounded by a sheath or coat which contains a quantity of a special kind of fat. There are a great many points of view from which we can think of a nerve as if it were an electrical wire, and the sheath may be regarded as what is called an insulator—a thing to prevent the current that flows in the nerve from leaking outside it. It is very interesting to take a modern electrical cable such as men lay in the Atlantic Ocean, and to cut it across and see what it looks like; and then to take a good-sized nerve and cut it across and magnify it so as to compare it with the cut cable. We see at once that men have found it useful to make their cables on exactly the same principle as nerves are made, with bundles of fibres big and little, all carefully insulated from each other. Of course, the nerve is a million times more wonderful, but the general principles of the way in which the nerve-fibres are packed together, and the way in which each is sheathed so as to prevent any leakage of its precious current, are really just the same as in the case of the cable.

When we excite our "funny-bone," as we call it, by hitting it, we feel a tingling in our fingers. We have excited the fibres which carry feeling along the nerve from the fingers to the brain. In other cases when we excite a nerve, muscles will twitch. We have excited fibres which carry orders along the nerve from the brain to those muscles. This shows that nerves carry something, and may do so in either direction, from the brain, or to the brain. The nerve-fibre is therefore a conductor. It is just like the wires in the cable. They do not make messages, but they carry them. What runs along the wire will run in either direction. It is probable that any particular nerve-fibre carries what it carries only in one direction.

### THE LIVING NERVE THAT CARRIES MESSAGES THROUGH OUR BODIES

The wire carries an electrical current. As long as the wire is not broken, and is properly insulated, the current will run. The wire is not alive, and, though we by no means understand what happens in it, yet it has not about it the mystery which we find when we look at a nerve.

For the noteworthy thing about a nerve is that it will only carry what it carries *when it is alive.* We can remove a piece of nerve from an animal that has been killed, and can study it in various ways. If we keep it moist with water containing a little salt, and if we keep it warm enough, it will live for quite a long time, and as long as it is alive things that disturb one end of it will send something through it. But when it dies it will no more carry messages than a piece of string will. What makes the difference between life and death in the nerve we cannot understand until some day, perhaps, we shall learn what life is. We can see no change under the microscope to account for this difference, for we have to kill the nerve in order to look at it under the microscope.

### THE MYSTERY OF THE NERVE-CURRENT THAT NO MAN CAN UNDERSTAND

The thing that runs along the nerve we call a nerve-current, or a nervous current. Current simply means something that runs, and that is really almost all we know about it. It is not the same as anything else in the world; it directly depends upon the life of the nerve, as we have seen. It is not electricity. Curious changes are produced in a nerve when a nerve-current runs along it, and among these changes is the production of electrical currents of various kinds, which have been long and carefully studied. These show that an electrical change has been produced in the nerve when a nerve-current runs along it, and the study of these electrical changes may help us to understand the nerve, but it is a very great and serious mistake to suppose that the nerve-current is electrical.

Electrical currents in a cable or anywhere else move at a wholly different speed from that of a nerve-current. Nerve-currents have been measured again and again, and they travel at rates which, compared with the movement of electricity, are very slow. The rate of a nerve-current seems to be about the same as the rate at which a baseball can be thrown. An electrical current is hundreds of thousands of times faster.

Nothing seems to be used up in a nerve when it conveys a current, any more than in the case of a telegraph wire. So we cannot make a nerve tired. As long as it remains alive, it will go on sending currents as often as we choose to start them in it. The case of a nerve-cell is very different.

### THE NERVE-CELLS UPON WHICH ALL OUR FEELINGS DEPEND

We have only been talking about conductors, remember. We have, so to speak, taken a piece of one of these conductors, just as if one took a piece out of a cable, and we have studied that. But if we wished really to understand telegraphy, we should have to study what is at the ends of the cable, and that applies to the case of the nerve too. We found that we could excite a nerve by hitting it against something, as when we hit our funny-bone, or by pinching it; and there are dozens of other ways, as, for instance, by giving one end of it an electrical shock, dropping chemicals on it, and so on. But, of course, that is not what happens naturally in our bodies. We must find where the nerve comes from.

Every nerve-fibre grows out of a nerve-cell. It is part of that cell. It is only the servant of the cell, carrying orders from it or messages to it. The real thing, where the greatest mystery lies, and upon which everything depends, is the nerve-cell. When we study the development of the body, we find that every nerve grows out of the cell that it belongs to; we find also that, if a nerve be cut across, the part which is next the cell is unhurt, but the part which is separated from the cell invariably dies. We find also that, if a nerve-cell is destroyed or poisoned, the nerve-fibre running out from it invariably dies, and if the nerve-cell has been actually killed, that nerve-fibre can never recover. So *these* "cable wires" are not merely alive, but they are created by living cells, of which, indeed, they are living parts. That is one of the marvels which make a cable a very simple thing indeed compared with a nerve.

### THE DENSE FOREST OF NERVES THAT GROWS UP IN OUR BODY

A nerve-cell may have only one fibre coming from it, or it may have several. Very frequently, for certain purposes, we find nerve-cells which have one fibre coming out from each end of them. The fibres from any nerve-cell are very often found going to meet the fibres from another nerve-cell. Suppose, then, we can trace a nerve-fibre from a cell somewhere in the brain, for instance, and we find that it meets another fibre from another cell, perhaps at some other place in the brain. It is interesting to know whether the two fibres run into each other. Careful study shows that the fibres never run into each other. At their extreme ends they break up into tiny little fingers, so to speak, and the fingers of the two fibres will interlace; but they never run into each other. If we study parts of the brain where many nerve-cells and nerve-fibres exist together, we find, as someone has said, that it is very like a dense forest. Their leaves and branches intermingle with each other in the closest possible way; but they never actually join. We shall never find a leaf that belongs to two trees.

### WHAT THE SIMPLE BRAIN OF A BEE OR WASP IS LIKE

All this is very important, because it teaches us that just as a gas is made of atoms, just as the body as a whole is made of cells, so the nervous system is made up of true units which are also cells, and though these cells are of a very peculiar kind and produce fibres which may run right away from the body of the cell for inches or even feet, yet each cell remains a true unit.

In the very lowest animals that have nerve-cells and nerves, the number is very few, and the arrangement very simple. They are usually arranged merely to carry feeling from the outside of the animal to its inside. But as we ascend the scale, nerve-cells and nerves get more numerous, and often, for convenience, numbers of them get bunched together into little balls, each of which is a sort of nervous centre, perhaps somewhat like a telephone exchange.

When these collections of nerve-cells become very large, they make a thing that we can only call a brain, and such are the brains of a bee or a wasp, for instance. The whole arrangement of nerve-cells and nerve-fibres is called a nervous system.

When the first backbones came into existence, there also came into existence a number of new nerve-cells and nerve-fibres, and the central home of this new nervous system was inside the backbone. The old nervous system, such as the insects have, remained, and communications were established between it and the new nervous system.

### HOW THE BRAIN SENDS AND RECEIVES MESSAGES THROUGH THE NERVES

In all animals that have backbones, both these nervous systems are found, and we may say very roughly that while the old one, which we ourselves inherit from the days before backbones, looks after the interior life of the body, it is the new nervous system that is the instrument of the mind. At its upper end, the long tube inside the backbone opens out, as we know, into the hollow skull; and in the same way the nervous matter which is found in the backbone, and which we call the spinal cord, becomes enlarged, and forms what we call the brain.

The brain and the spinal cord form what is often called the central nervous system. Through holes in the skull and through openings in the backbone run nerves which connect the central nervous system with every part of the body, and every part of the body with the central nervous system.

It seems quite clear that, whether we take the group of cells that forms a mere hair or any other of the least important parts of the body, we always find that it has a perfect double connection with the central nervous system. The brain, or the spinal cord, or both, can send to it messages upon which its life depends, and it, on the other hand, can send messages to them.

When we come to study the central nervous system, we find it so arranged by means of this double connection that every tiniest part of the body is really in true communication, when necessary, with every other part of the body without exception. It is this amazing fact that helps to explain how the body becomes a whole in spite of the infinite variety and number of its parts. In no city on earth, however rich in telephones, and speaking-tubes, and telegraphs, and post-offices, and messenger-boys, is there any arrangement a thousandth part as wonderful as the arrangement by which the nervous system connects all the parts of the city of Mansoul, as John Bunyan called it.

### THE FOREST OF NERVES RUNNING TO AND FROM EVERY PART OF OUR BODY

We have already learnt what is necessary regarding nerves. If we simply understand that the lining of the heart, the wall of a vein, the base of a nail, every muscle-fibre, and all other parts of the body are doubly connected by nerves with the central nervous system, we do not need to inquire how and where these nerves run; though, of course, the doctor has to spend long months and years in studying this. We must devote ourselves now to the central nervous system, and especially the brain.

We saw when we were studying alcohol that the central nervous system consists, in a way, of a number of levels, or layers, and that, as the bodies of animals have become more and more wonderful, new layers have been, so to speak, piled up on the older ones, and each new layer is, so to speak, the master of all the layers below it. It is in this way that we can come to understand the working of the brain and the spinal cord. The spinal cord is very old, so to say; its business nowadays is to attend to things which are beneath the notice of the brain, as, for instance, the movements of the stomach and that kind of thing. It is a sort of highly trusted and responsible butler in the house of man, and, like other butlers, it not only looks after a great many small matters on its own account, so as not to trouble the master, but it is also the master's means of communication. As a rule, the master gives orders to the butler, and then the butler does the rest.

### THE SPINAL CORD THAT ACTS AS BUTLER TO THE BRAIN

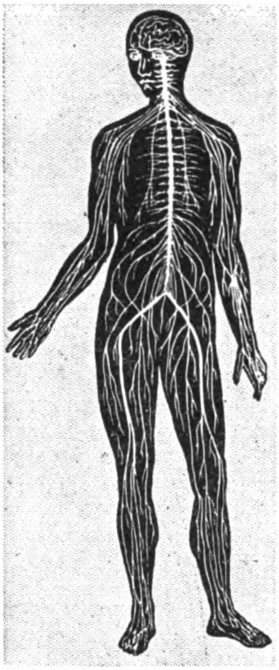
On the other hand, tradespeople and so forth, when they have anything to say, do not go to the master, but interview the butler, and he takes the message to the master; so also does the spinal cord. When I close my hand, my brain, which gave the order, did not speak directly to the muscles of my hand. No nerve-fibres run directly from my brain to those muscles, but nerve-fibres do run from my brain to the spinal cord, which is my butler. They give orders to certain nerve-cells in the spinal cord, and from those nerve-cells there *do* run fibres which go to the muscles of my hand. In the same way, when I feel a draught on my skin, the nerves from my skin do not run direct to my brain; they run to cells in the spinal cord, from which communication is made to my brain.

If we cut across the spinal cord, and take a very thin slice of it and stain it with various dyes that will show up the way in which it is made, we find that its structure exactly corresponds with its duties. We find in it fibres and cells. Some of these fibres are running to the brain, some from the brain; a great many of them arise from cells in the spinal cord, and run to other parts of the spinal cord, and end there. If, for a moment, we think of the spinal cord as a huge exchange, or place of business, then these fibres are like the private wires that do not come from, or go to, the outer world, but connect one part of the place of business with another.

### THE WONDERFUL BOX IN WHICH THE CENTRAL NERVOUS SYSTEM IS KEPT

The usefulness of the spinal cord very largely depends upon the proper working of these beautiful arrangements which keep every part of it informed as to what every other part of it is doing, and enable different parts of it to act in harmony when they so require—which is practically always.

The picture on page 3565 shows us the central nervous system as it appears when taken out of the wonderful box—the skull and backbone—which exists to protect it. We see how, at its upper end, the spinal cord becomes slightly thicker so as to form what we might call a bulb. That, indeed, is one of the names for this part of the brain. It contains the group of nerve-cells which controls our breathing, and the destruction of which means instant death; also another group of nerve-cells which controls the heart; another group which controls the size of the blood-vessels; another for the acts of sucking and swallowing; another which controls perspiration; and there are probably more. All of these are contained in a little portion of nervous tissue that is just about the size of the end of one's thumb. Above the bulb, things become very complicated. If we had to begin with the study of the grown-up human brain, we should never find the key to it; but if we study the brain as it develops, and if we study the brain in animals, the thing becomes clear. We see quite plainly that what is the lower underneath part of the brain in us, all huddled and squeezed together and completely poked out of sight by something else that has grown over it, is the old brain, the first brain that ever was, so to speak. It contains countless numbers of nerve-cells, arranged in groups with different duties. It is mostly concerned with movements of the body, and in lower animals it is also the place where hearing and seeing and feeling are done. In ourselves we know that some of these senses have become so delicate and wonderful that they require new machinery, and the old centres which were good enough for lower animals are now, in us, only half-way houses towards the new brain.



**This picture shows us the wonderful arrangement of nerves in our body, like an elaborate system of telegraph wires. The strong white line is the spinal cord running up to the brain.**

Behind the old brain there is a large and important piece of nervous tissue which has a name that really means the little brain. It is called the *cerebellum.* This cerebellum, we have found, gets larger and larger in higher forms of life, but we cannot find that it has anything to do with feeling. We do not hear or see there, it starts no movements, and certainly the will and the powers of thinking do not live there. We find that it is a great instrument for making the body do what we want. The power of balancing the body lives there. A drunken man staggers because he has poisoned his cerebellum. Also the balanced use of the muscles for complicated and delicate actions, like painting or playing the violin, depends upon the control of the cerebellum. It may be thought that these duties are not very exalted, and we may wonder, therefore. why the cerebellum should get bigger as we ascend in the scale of life. But we have already learnt that the one thing in the world that we can do is to move things, our bodies and things outside them. Through this power of movement, and only through it, our minds can live and act. So it is very important that our control of movement should be as fine as possible.

It can be proved that in the main line of ascent of life, more and more delicacy and accuracy of movement have always appeared. Part of the history of progress is the replacing of strength by skill. Babies and small children are very clumsy, and as they gradually become more skilful, this means mainly that the cerebellum is developing and getting the powers which it has in grown-up people. In proportion to size of the whole body, the clumsy, stupid animals are those that have a very small cerebellum. The best example of this is one of the stupidest of all the higher animals, the hippopotamus. There are three young hippopotamuses at a zoo, as I am writing, and since it was found how small the brain and the cerebellum of the hippopotamus are, I have been carefully studying these young animals. We can understand that when we catch anything, following it with our eyes, and then getting our hands or our mouth to it, we must be using the cerebellum. The hippopotamus has practically no idea of catching at all. It takes a very long time to see even things that it likes, and if they get into a corner, it is so clumsy that it has not sense enough to use either its feet or its mouth to get them out again.

### THE LITTLE BRAIN OF THE GREAT HIPPOPOTAMUS

All this depends upon the smallness of its brain, and especially of its cerebellum. It is reckoned that the brain of the hippopotamus weighs about the same as that of the horse, the weight of whose body is only one-fifth as great. It has been proved over and over again that, in the history of life, success has always gone more and more to brains, to skill as against strength, to mind as against muscle. The hippopotamus is a remarkable instance of an animal that has survived through long ages from the days when brains in general were much smaller than they are now, and the explanation is not to be found in its huge size and strength, but entirely in its mode of life. Its size and strength could never have saved it against better brains.

In the past there have been far bigger and stronger animals than even the hippopotamus, and they have all died out, but the hippopotamus is content to live upon grass and similar plants growing in rivers. It has its nostrils right on the very top of its face, so to speak, and so it can lie with its whole body in the water, and just leave its nostrils above to breathe by. In this way it saves itself by hiding, and still lives on, while the other stronger and cleverer animals have completely disappeared from the earth.

As we pass upwards in the scale of life, we find that with the growth of the cerebellum, and the development of skill, there comes a time when even the mouth, that dogs and cats and lions and sea-lions are so clever in using, is not a good enough instrument for the clever brain.

### THE USE OF THE ARMS WHICH GIVES MAN HIS GREAT POWER

Something even better is required, and so, in the main line of ascent, we find that the animals called lemurs, which are a very humble and ancient kind of monkey, use their hands a little for grasping as well as walking, though they prefer to use their mouths, as anyone can see who feeds them at the Zoo. But when we reach the highest apes, we see that they find and examine, and lift their food with their hands, and then carry it to their mouths. The arms, then, limbs which for countless millions of years have been used by all sorts of different animals for the same purposes as the hind legs, and for no other, now come to have special purposes of their own, and every finger becomes precious.

Cleverer even than the half-erect apes is man, who, after crawling babyhood is past, frees his fore limbs for ever from the duty of locomotion, and learns how to use every one of his fingers separately, as with the typewriter or the piano. There has therefore been an immense development of skill in man—though mere strength has decidedly fallen off—and with it there has necessarily gone a great development of the cerebellum.

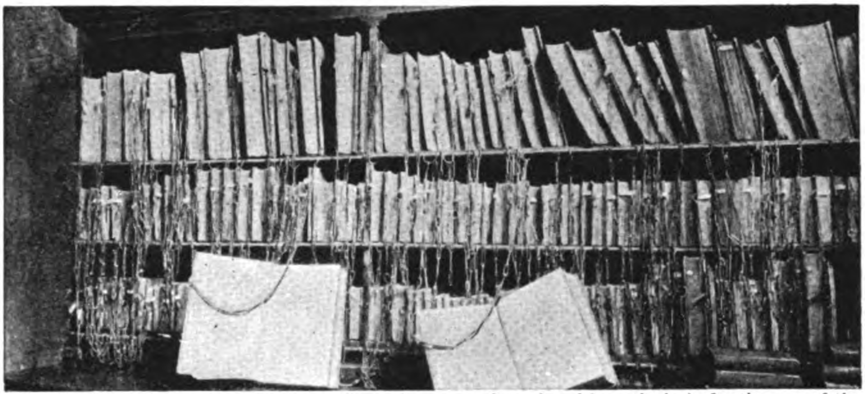
This is very interesting, because it helps us not only to understand the brain, but also to understand children. Children belong to a race that lives in the world by its cleverness of all kinds, and so they like to practise their skill. This is why children love games of skill, and this especially is why, ever since children existed, they were fond of balls.

### WHY IT IS RIGHT THAT BOYS AND GIRLS SHOULD PLAY

Of course, grown-up people do not like to have their windows broken; but still it is right and natural for children to play. What we call play, and stupidly think of as waste of time, is now known by wise people to be part of the necessary education of a child, if it is to reach the best possible for it in health of mind and body. Its play is really an essential part of the work of the child.

It is a great pity that, though any mother cat may be seen teaching her kittens to play, for she knows how important it is for them to become skilful, many children in our land have nowhere to play but the street, no one to teach them good games, no one to care what becomes of them. And yet, if we are not to care about our children, and therefore the future of mankind, many of us would perhaps not care if the whole earth shot up in flame and vanished this very moment. But we hope that before long all children will be able to have happy playtimes.

The next part of this is on page 3715.



When books were scarce and very costly, copies were often placed in cathedrals for the use of the people, but they were chained up for safety, as shown in this picture of books still in Hereford Cathedral.

# MEN WHO GAVE US PRINTING

CONTINUED FROM 3490

GUTENBERG

It will help us to understand this story if we read on page 887, and the pages that follow, the story of printing as it is done to-day. That story makes us familiar with the terms used and the methods now employed. Having in mind the perfection of the present-day printing, we shall realise the more how extraordinary was the plight of the civilised world when men had no printing of any sort, and the few books that did exist were written by hand.

It is difficult to think what the lives of people must have been like in those days with nothing to read. They could not have been much better off in things affecting the mind than savages of our own time. A few stories and legends were passed on by word of mouth, but that was the only help the imagination had. People lived in the densest ignorance.

A rich man, we might think, would be proud to be wise and learned. But in those days the rich man was very ignorant as a rule. So far from being able to read, he considered reading and writing altogether too lowly an occupation for him. There were those who could write, and who could teach him to write, but that would never do for the powerful rich man of those early days. He paid poor monks and clerks to write for him. He would not even sign his name. To sign his name was like putting on his armour—something that he paid a vassal to do for him. Gradually there grew up a demand for knowledge. But there was little to meet the demand. There were not as many books in all Europe as a little library possesses to-day. Each book took perhaps years to make, and the world would have been better without many of the books that did then exist, for these books simply appealed to the superstitions of men. By teaching them to burn and torture poor innocent people who were ignorantly believed to be witches, these books helped to make the age one of the worst in history.

There were some better books, of course. There were a few written copies of books that had been composed by the great writers of Greece and Rome These were very highly prized by the few who knew of them and loved them. Thus we find that a man, wishing to buy a country house near Florence, sold his edition of a famous book, and the man who bought it sold a piece of land to get the money to pay for it. The longing for books was increasing, but the power to produce them more rapidly did not keep pace with the demand. Thus the need for some grand new invention to give people books was very urgent when John Gutenberg, the inventor of proper printing, was born, at Mainz, Germany, about 1410.

### GUTENBERG, THE ALMOST UNKNOWN MAN WHOM ALL MEN HONOUR

It is a curious thing that printing, which records the history, so far as it is known, of every other invention, should tell us so little of its own story. We do not know with whom the idea of printing first began. We know that Gutenberg was the first man in history to give the world a book printed with separate pieces of movable type, but the credit of the invention is claimed for other men who lived at the same time as himself. We do not even know exactly the year of Gutenberg's birth. The date generally accepted is the year 1410, but it is also stated to have occurred eleven years earlier. We know nothing about his boyhood. His work caused the greatest revolution in the history of knowledge that the world has ever witnessed, yet we are as ignorant of the story of his private life as if he had been an ordinary citizen.

The reason for the confusion as to the actual invention of printing may be a little more easy to understand if we take a glance at the attempts at book-making which were being made when Gutenberg was a youth. The idea that there was a better way of producing books than writing them by hand had already entered men's minds. Men had found out the way to print from what we call woodcuts. These were drawings cut into blocks of wood, which, on being inked over, printed a picture on the paper pressed upon them.

### HOW MEN LEARNED TO PRINT PICTURES BEFORE THEY COULD PRINT WORDS

That was picture-printing, and it made men familiar with the thought of tracing figures upon paper by means of carved wood, from which many copies could be printed.

But that was a long way from printing a book from types which, when one book had been printed, could be used again and again to print other books. The woodcuts gave only pictures; the title was also cut. It took, you can see too long to carve a page of words on a block of wood, and it would have been impossible to print many books for which every page of matter needed a separate block of wood. What they wanted was a number of movable letters that could be put together to form words, and then when the page was printed the letters, or types, could be distributed, and set up again to form other pages. It fell to Gutenberg to invent this wonderful scheme—or that, at any rate, is the decision of the most historians.

The rival historians tell a different tale. They say that a man named Lourens Janszoon Coster, of Haarlem, Holland, was the inventor of the movable types, and that he actually printed a book from them; and that then his servant stole the types and ran away with them to Gutenberg, whose service he entered and whom he taught to print. In studying the history of printing we are bound to take all the evidence, and, having done so, we are able to say that there is very little to support this story.

### HOW GUTENBERG'S PARENTS WERE DRIVEN FROM MAINZ BY A MOB

The story about Coster was never printed until a hundred years after the death of Gutenberg. We may be sure that the world would have heard of it in Gutenberg's time had there been any truth in it. Germany and Holland had their law courts then, and Coster would have gone to law against Gutenberg or the faithless servant had there been any truth in the story. When people did have a case against Gutenberg, they did not hesitate to go to court against him, as we shall see.

Let us now take the life-story of Gutenberg as far as we know it. His parents were of noble birth. His father's name was Gansfleisch, but he took the name of his mother, so that that name might be carried on, she being the last descendant of her house. She little thought what honour and glory he would bring upon her name. When John was about ten years of age his parents had to flee from Mainz. There was a great quarrel between the poor and rich of the city, and his parents, who were among the rich, had to fly and take their boy with them. They went to Strasburg, and there the inventor of printing grew up.

He was a lad of bright and inventive mind. When little more than fifteen he was engaged in experiments for polishing stones and making mirrors. He required more money than he was able to secure at home, therefore he induced a citizen, named Andrew Dritzehn, to become security for him, so that he could borrow the money.

### A BUSINESS IN LOOKING-GLASSES THAT FAILED, AND WHAT CAME AFTERWARDS

Dritzehn must have thought highly of the youth, for he entered into partnership with him, the business being the polishing of stones and the making of mirrors. Of course, looking-glasses had been made before this, but young John had found out a way of making better ones than had been known before. They must have managed very well, for they seem to have remained in this business for the next twelve or thirteen years. A lucky accident, perhaps, took them out of it. There was to be a pilgrimage to Aix-la-Chapelle, and the partners had counted on selling a great many mirrors. The pilgrimage was postponed, and the stock remained unsold.

This seems to have put an end to the business. Gutenberg now turned to the work of his life. He took into partnership two other men, named Andrew Heilmann and Anton Heilmann, his former partner, Dritzehn, also being in the business. They began as printers, but apparently their idea was to use woodcuts; the idea of the movable types had not yet come. The partners must have thought well of the business, for when, in 1441, Dritzehn died, his brothers went to law to try to make Gutenberg take one of the brothers into partnership in the dead man's place. Gutenberg won the day. He neither had to take the brother into partnership, nor had he to reveal the secrets of his business.

### GUTENBERG'S RETURN HOME AFTER HIS LONG EXILE

After this comes a period of mystery. Gutenberg borrowed money for carrying on his experiments, and that is all we know. All his money seems to have gone in his work, for there is a record showing that his wife paid the taxes for his house during this time. Then something seemed to call him to his old home. Perhaps he felt that, as he was about to make known his great art to the world, his native Mainz ought to be its cradle. He returned to Mainz in 1446, after having been an exile for twenty-six years. He made his home in a house which formed part of the possessions of his family. That he had now completed his scheme for the new printing we know from the fact that he was able to borrow money from a shrewd merchant of Mainz, named John Fust. The latter provided two sums of money to enable him to make his types and to purchase other materials. As security Fust had all the printing stock which Gutenberg was to make.

They took into their service a skilful worker in metal named Schoeffer, and he was able greatly to assist Gutenberg in carrying out his ideas in the making of the type. Gutenberg seems to have set out to make each letter separately. If he wanted 100 copies of the letter A, he would set to work to carve 100 copies of the letter in wood.

### GUTENBERG'S BIBLE, THE FIRST PRINTED BOOK IN ALL THE WORLD

But this was too slow; besides, the wooden letters were too soft to last. The improvement that Schoeffer suggested was important. He carved the letter on the end of a piece of metal. With this metal letter he punched a mould in a softer metal. Then all that remained to be done was to melt metal and pour it into the mould, and copies of the letter could be made as fast as metal would harden.

The fact that Schoeffer did this for Gutenberg was very important, but does not take any credit from Gutenberg. The first great idea was Gutenberg's; the carrying out of the details owed much to Schoeffer, who was the very man that Gutenberg wanted at the time.

And now the work of Gutenberg's life was begun. He had determined to print a copy of the Bible. It took a long time to do it, and the cost was very heavy. The printers had everything to do. They had to make their types, they had to set them up and correct them, then print the pages and set up and correct and print others. There never was enough money for the work. Before the first three pages had been printed 3,000 florins had been spent, and Gutenberg was always haunted by the fear that there would not be nearly enough money to carry out the work.

At last, in 1455, the first printed book, the complete Bible in the Latin tongue, bound in two great volumes, was presented to the world. The triumph of printing was at once established. Men agreed that it was "as clear as handwriting," and that, seeing that many copies had been printed at the same time, the cost was far lighter than that of copying by men, while the work was done far more quickly.

### THE DISASTER THAT OVERTOOK GUTENBERG IN THE HOUR OF HIS TRIUMPH

But Gutenberg's sun set as soon as it rose. No sooner had the great Bible been printed than a quarrel arose. Gutenberg and his partner had done a great and splendid thing in giving to the world a noble Bible as the first fruits of the printing press. It is something of which printers have ever since been proud, that the first book ever printed was the greatest and holiest book in the world.

But when that work was ended, strife at once broke out. The wealthy Fust claimed back the money he had lent. He knew that Gutenberg could not pay him, and that, perhaps, was why he immediately pressed his claim. As he could not have the money he seized all the printing plant. He was legally entitled to do this, but many things are legal which are monstrously cruel. Poor Gutenberg, in the very hour of his triumph, was kicked out of his office, and his beloved press was left to Fust and Schoeffer, while he was poorer than when the idea of printing first entered his brain.

However, he was not to die without another effort to further his invention. He found a good friend in Dr. Conrad Humery, who enabled him to set up another press, from which he printed one or two books.

### THE SAD ENDING OF A LIFE THAT HELPED TO CHANGE THE WORLD

But nothing prospered with Gutenberg after that, and he ended his days as a pensioner, living on the bounty of the Archbishop of Mainz. Nobody noted his death. He passed away in 1468, thirteen years after the completion of the work which made him one of the world's greatest men. Nearly four centuries afterwards the citizens of Mainz erected a statue in his honour. He needed it not then. His fame had gone forth into all lands. Within sixteen years of the printing of the first Bible the art of printing was being practised in the principal cities of Germany and Italy. Presses sprang up in Strasburg, Cologne, Rome, Florence, Naples, Bologna, and Milan. In England people were too busy with the Wars of the Roses to notice the miracles that were being performed. But for them, too, came the hour and the man.

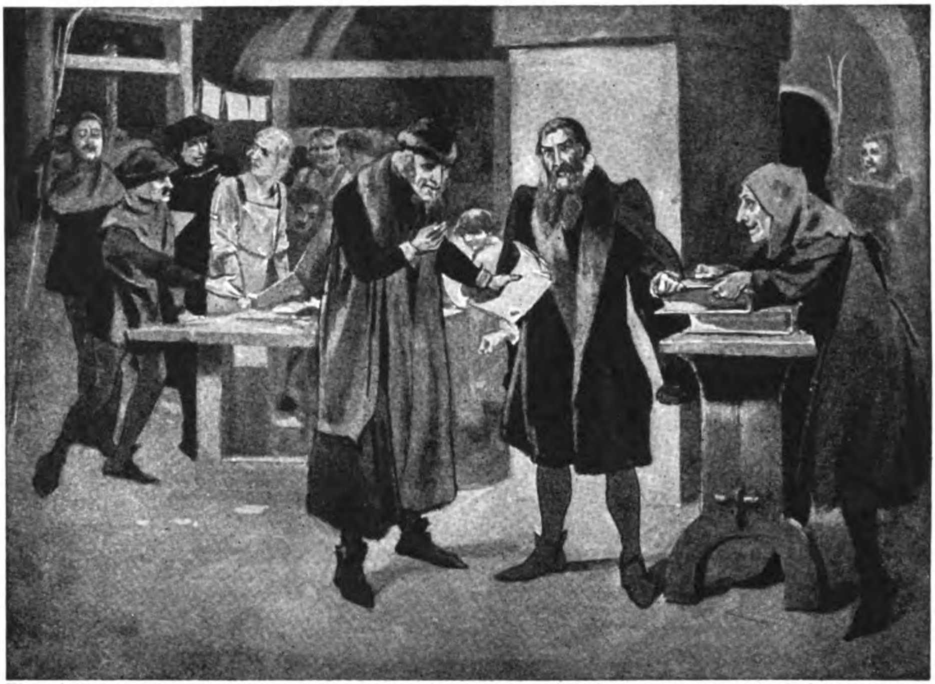
It was in 1477 that the very first book was printed in England. It was a great time for England, for it marked the dawn of our real learning. Remember that until fifty years before this time the English language was never taught in that country! French was taught for writing and reading by the upper classes, but not English. There was no written English. All documents and letters were written in the French which the Normans had brought over with them. But they were to have books for Englishmen, printed in their own mother tongue. The man to work this wonderful change was William Caxton, whose name is honoured in England as much as that of Gutenberg and the other men of his age who all helped forward the great art.

### WILLIAM CAXTON, THE MAN WHO CARRIED PRINTING TO ENGLAND

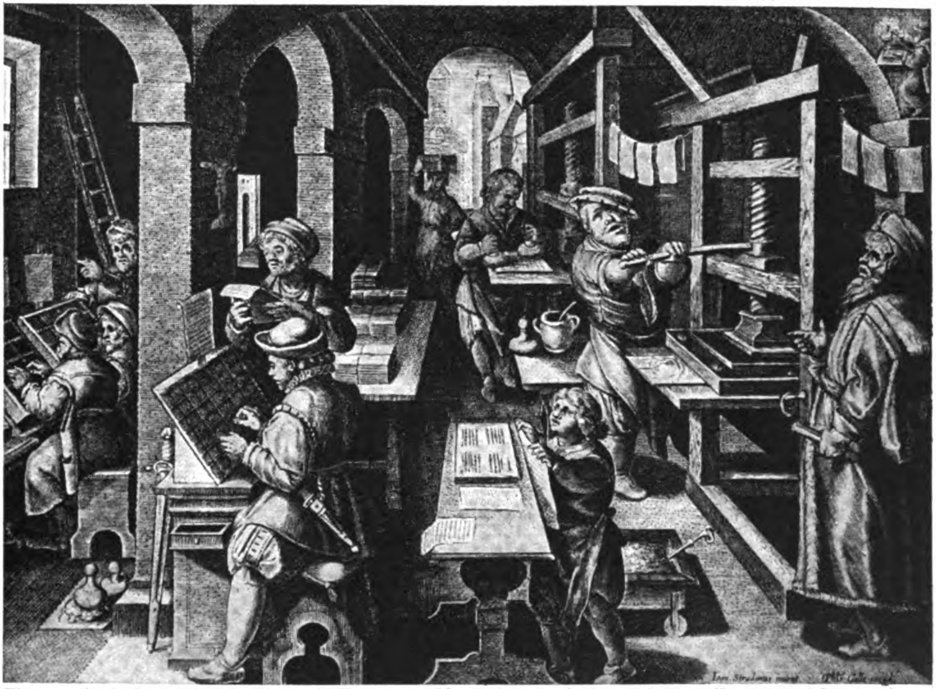
Caxton was born in Kent about 1422, so that he was twelve years younger than Gutenberg. In these days we should think it strange if parents did not educate their children. It was different in Caxton's days, and when he was an old man he used to say that he always felt bound to pray for the soul of his father and mother, because they had sent him to school. They little thought when they put their boy to school what a great thing they were doing for the education of the whole English-speaking race. After he had quitted school they apprenticed him to a wealthy mercer, who afterwards became Lord Mayor of London, and thought so well of Caxton that at his death he left the youth a sum of money.

After he had served his apprenticeship Caxton went to Bruges. He was then twenty-four years old, and was able to set up in business for himself. At that time several English merchants were engaged in business in Bruges, and Caxton, being an energetic and clever man, prospered. We have evidence of his prosperity in the fact that four years after his arrival he became security

# IN THE EARLY DAYS OF PRINTING



There has never been a more important invention than printing. The first man to print a book from type was John Gutenberg, who, at Mainz, in 1455, produced a Bible, the first printed book the world had ever seen. A merchant named Fust lent Gutenberg money for his experiments, and when Gutenberg could not pay back, Fust seized his printing press and type, and turned him out of the office, at the moment of triumph, as we see here.



The art of printing soon spread all over Europe, and here we see a famous printing office, that of Stradanus, at Antwerp, at the beginning of the 17th century. Many small printing offices to-day are very much like this. The wooden boxes in which the type is kept have not changed at all from the pattern seen here.

This picture is from a rare engraving in the British Museum, and the photograph of the Chained Library by W. H. Knowles.

for another merchant for the sum of £110, which would be a large amount in our money. So far as we know, Caxton went to England on only two occasions during the next thirty years. He made himself master of several languages, and became a sort of English ambassador at Bruges, the British government entrusting him with missions of importance.

### HOW THE SACKING OF A CITY SCATTERED PRINTERS THROUGHOUT EUROPE

As we have seen, the knowledge of printing soon spread about Europe. It was largely helped in an unexpected direction. The city of Mainz, where it had begun, was sacked in 1462. The office of Fust and Schoeffer was wrecked, and their workmen were scattered. They spread into various countries, and took with them their knowledge of printing. Thus the misfortune of Fust proved a blessing in disguise to other people. Books multiplied, and printed copies came into the hands of Caxton.

When he was nearly fifty years of age he set to work to translate into English a book on the history of Troy. No doubt he had enjoyed reading it, and wished that people who knew only English should share his enjoyment. When he had translated it he caused it to be printed, and it appeared in Cologne, so far as is known, in 1474, six years after the inventor of printing had been laid in his grave. We do not know whether Caxton actually set up the type and printed the book himself, or whether he paid someone else to do the work. We do know that he had been much in the company, in Cologne, of a man named Colard Mansion, a famous writer, who had become a printer.

### THE BOOK THAT CAXTON PRINTED IN A WESTMINSTER ABBEY OFFICE

Whether the book was printed at Bruges or Cologne can never be decided, and it really does not matter. The point of importance for us is that, delighted with the new art of printing that he had mastered, Caxton left for England in 1476 to set up as a printer.

He took an office in premises belonging to Westminster Abbey. It is commonly supposed that he printed actually in the abbey. That, however, is not the case, for his office was in or near one of the almshouses which a king had founded. The book translated and printed abroad by Caxton was the first which had ever appeared in the English tongue. The first book ever printed in England was either his book on the game of chess, or one devoted to the sayings of the philosophers. He now had a busy time as a printer. He printed short stories and pamphlets, he printed the works of Chaucer, religious works, and many others. Nearly a hundred of his books still exist; not all perfect, of course. Parts of some were found to have been used in binding later books; others had been nibbled by rats and carried to their holes in Westminster Abbey. Some of his books sell to-day for over $10,000 each

One of the men who helped Caxton with his printing was Wynkyn de Worde, who went over with him from Belgium, and, at Caxton's death, in 1491, succeeded to his printing plant. He carried out the work which his master had begun. He improved the type, and printed over 400 books.

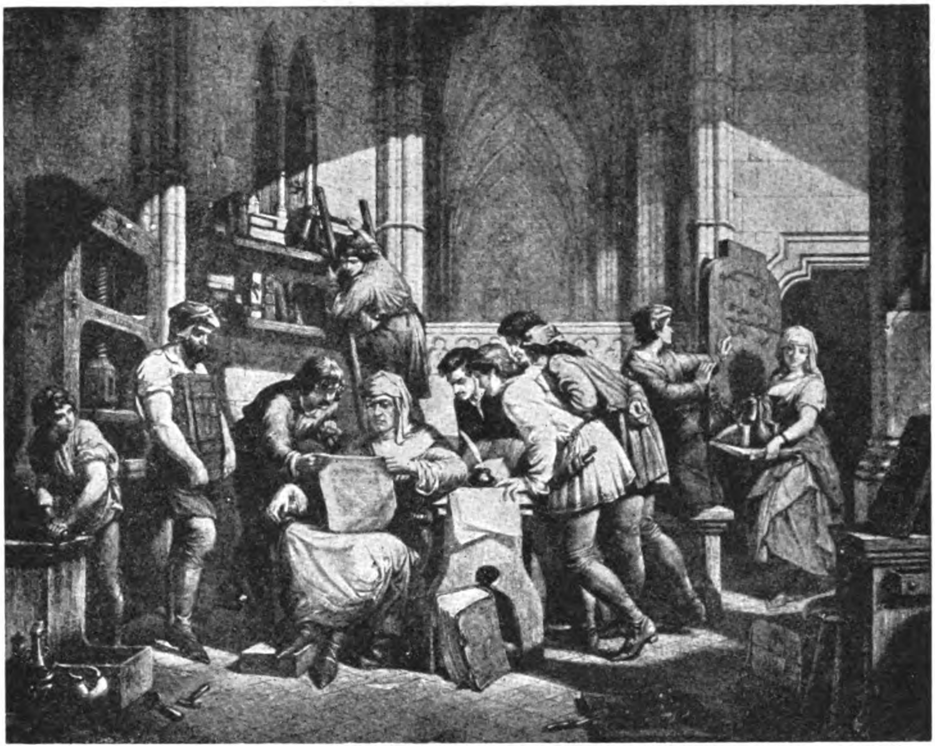
### THE MEN WHO FOLLOWED CAXTON AND SPREAD PRINTING IN ENGLAND

But before the death of Caxton printing had made a great advance in England. Two years after Caxton's return to England a printing press was set up at Oxford by Thomas Rood. Two years after, one was started at St. Albans, by a man called the schoolmaster. A man named Lettou started for himself in London in the same year. Cambridge waited for over forty years before setting up her first printing press.

In the meantime, the art had spread far and near over the country, and Scotland had her first press in 1507, when two men named Walter Chepman, who found the money, and Andrew Myllar, a bookseller, who had been to France and learned the way to print, obtained a licence from the Scottish king, James IV., to set up in business as printers. The firm was not carried on after the death of these two men, and then for some years the Scottish Parliament, while having its Acts of Parliament printed, actually had to send to France to get the work done.

The art had now become firmly established in Europe. It spread to our American continent by the help of a Spaniard in Mexico, who, in 1536, published the first printed book ever

# PRINTING THE FIRST BOOK IN ENGLAND



When we speak of a revolution, we usually think of fighting and bloodshed, but in these pictures, peaceable as the scenes represented are, we really see the beginning of one of the greatest revolutions in English history. Nothing has had such an effect upon the progress of the world, or so changed the characters of peoples and nations, as the invention of printing, and here we see William Caxton, who introduced printing into England in 1476, reading the first proof sheet from his printing press in premises belonging to Westminster Abbey.

**Caxton set up his printing press in the Almonry of Westminster Abbey, and there, while the nation was in a state of turmoil, Caxton worked away perfecting his art and producing books. While living on the continent he had printed one or two books in English, but the first book that is definitely known to have been printed in England is the "Dictes and Sayings of the Philosophers," although the earlier "Game and Play of the Chess" may also have been printed there. Here we see King Edward IV. and his queen visiting Caxton's printing office.**

seen in the West. The first English book was published in 1638, by Harvard College, which had been founded by an Englishman named Harvard, who had settled in America.

Of course, printing was not at first very good. The first improvements in type were made by Wynkyn de Worde. But the greatest were made by Richard Pynson. He, like Wynkyn de Worde, was a foreigner, whom Caxton had brought over to London. Pynson became printer to the King of England, and performed a most important service by printing the first book in Roman type, that is, type like that which appears on this page.

One of the most famous of early Continental printers was Aldo Manuzio, of Venice, who was born in that beautiful city about 1446. With him began the practice of printing, in addition to the ordinary copies of a book, some few copies on specially good paper and in fine bindings. Manuzio was the first to make the type called *italic*, type like that in which the word itself is here printed. It is believed that he took as his model for this type the beautiful handwriting of the great poet Petrarch.

### HOW THE GOVERNMENT TRIED TO KEEP KNOWLEDGE FROM THE PEOPLE

As printed works increased in England, education became better and more common, so that many people were able to read and discuss the events printed in the books and pamphlets. This alarmed the government, and in 1530 what is known as a press censorship was established. If a man printed anything not approved by the censor he was cruelly punished. This state of things lasted for more than 150 years, and the lot of the printer was so hard that printing became almost a lost art again. Men would not risk imprisonment and fines to publish works which the people wanted, but which the tyrannical censor might condemn. Even before the appointment of a censor, books had been seized and burnt by the Church. Not until 1694 was the office of censor swept away.

When the censor ceased to be, men plucked up hope again, and printing soon began to improve. Better type was made, but still the printing machinery continued pretty much as it had been from the first. The type had to be laid flat upon the press, and the paper printed by being pressed by hand labour upon the inked surface of the type. Not until 1814 was the printing of a newspaper by steam first tried.

### THE MAN WHO MADE THE FIRST STEAM PRINTING MACHINE

The inventor of the first steam printing machine was Frederick König, born at Eisleben, Germany, in 1774. He removed to England in 1806, and in 1814 constructed for the London Times two presses in which the paper was fastened to a cylinder and rolled over the type. These presses could each print 800 impressions an hour.

Improvements were rapidly made in England but in the United States the greatest improvements have been made. In 1846, Richard M. Hoe of New York built a press for the Philadelphia Public Ledger, on which the type were fastened to a cylinder which revolved and touched other cylinders on which the paper was fastened.

With this press 8000 copies could be printed every hour, and soon an improvement was made by which 20,000 could be printed. Up to this time no newspaper had a very large circulation for it could not print many papers in a day. This invention made possible the newspaper of today. Many were sent abroad and even the London Times was printed on American presses.

Next the type for each day were made in the form of a cylinder as you are told on page 895, and then the paper was printed from a continuous roll. Larger and larger presses have been built until now there seems almost no limit to the number of papers which can be printed, pasted and folded.

The "Times" steam press was the biggest advance in printing made since the day of Gutenberg himself. Since then new inventions for printing have followed each other with great rapidity. Printing coloured pictures has become one of the most wonderful of the printer's triumphs. For the setting of type, machines have been made which seem to do all but think; while the great machines that print the papers and books of the present day are among the most marvellous contrivances ever invented by the genius of man.

THE NEXT STORIES OF MEN AND WOMEN BEGIN ON PAGE 3697

# THE DISCONTENTED FIR-TREE

CONTINUED FROM 3508

Far away in the deep forest there once grew a pretty Fir-tree; the sun shone full upon him, the breeze played freely around him, and in the neighbourhood grew many companion fir-trees, some older, some younger. But the little Fir-tree was not happy.

"Oh, that I were as tall as the others are," sighed the little Tree, "then I should spread out my branches so far, and my crown could look out over the wide world around! The birds would build their nests among the branches, and when the wind blew I should bend my head just as the others do.'

The wood-cutters came in the autumn and felled some among the largest of the trees; this happened every year, and our young Fir, who was by this time a tolerable height, shuddered when he saw those grand, magnificent trees fall with a tremendous crash, crackling to the earth. They were laid in waggons, and horses drew them away, far, far away from the forest.

Where could they be going? What might be their fortunes?

So, next spring, when the Stork returned from abroad, the Tree asked him, saying: "Know you not whither they are taken?"

The Stork looked thoughtful, then he nodded his head, and said:

"As I was flying from Egypt to this place, I met several ships with splendid masts. I have little doubt that they were the trees you speak of; they smelled like fir-wood. They sailed gloriously, quite gloriously!"

"Oh, that I, too, were tall enough to sail upon the sea!" sighed the Fir-tree.

"Rejoice in thy youth!" said the Sunbeam. "Rejoice in thy youth, in the fresh life that is within thee!"

And the Wind kissed the Tree, and the Dew wept tears over him; but the Fir-tree understood them not.

When Christmas approached, many quite young trees were felled; they were chosen from the most beautiful, their branches were cut off, and they were taken away.

"Where are they going?" asked the Fir-tree.

"We know! We know!" twittered the sparrows. "We peeped in through the windows of the town below! We know where they are gone! We looked through the window-panes, and saw them planted in a warm room, decked out with such beautiful things—gilded apples, sweetmeats, playthings, and hundreds of bright candles!"

"And then?" asked the Fir-tree, trembling in every bough. "And then? What happened then?"

"Oh, we saw no more! That was beautiful, beautiful beyond compare!'

"Is this glorious lot destined to be mine?" cried the Fir-tree, with delight. "This is far better than sailing over the sea. How I long for Christmas to come!"

"Rejoice in our love!" said the Air and the Sunshine. "Rejoice in thy youth and thy freedom!"

But rejoice he never would. He grew and grew, in winter as in summer; he stood there clothed in green, dark-green foliage; the people that saw him said, "That is a beautiful tree!" and, next Christmas, he was the first that was felled. The axe struck sharply through the wood, the Tree fell to the earth with a heavy groan; he suffered an agony, a faintness that he had never expected; he quite forgot to think of his good fortune, he felt such sorrow at being compelled to leave his home; he knew that he should never see again those dear old comrades, or the little bushes and flowers that had flourished under his shadow, perhaps not even the birds. Neither did he find the journey by any means pleasant.

When the Tree first came to himself he was in a large, handsome saloon. Pictures hung on the walls, and on the mantelpiece stood large Chinese vases with lions on the lids; there were rocking-chairs, silken sofas, and tables covered with picture-books. The Fir-tree was planted in a large cask filled with sand, and hung with green cloth, and placed upon a carpet woven of many gay colours. Oh, how the Tree trembled! What was to happen next? A young lady, assisted by the servants, now began to adorn him.

Upon some branches, they hung little nets cut out of coloured paper, every net filled with sugar-plums; from others, gilded apples and walnuts were suspended, looking just as if they had grown there; and more than a hundred little wax tapers, red, blue, and white, were placed here and there among the boughs. Dolls that looked almost like men and women seemed dancing to and fro among the leaves, and highest, on the summit, was fastened a large star of gold tinsel.

"This evening," they said, "it will be lighted up."

"Would that it were evening!" thought the Tree. "Would that the lights were kindled, for then—what will happen then? Will the trees come out of the forest to see me? Will the sparrows look in through the window-panes?"

At last the candles were lighted, and then, suddenly, both folding doors were flung open, and a troop of children rushed in as if they had a mind to jump over him; the older people followed more quietly. The little ones stood quite silent, but only for a moment; then their jubilee burst forth, and they shouted with joy till the walls re-echoed.

The children danced and played about with their beautiful playthings, and no one thought any more of the Tree except the old nurse, who came and peeped among the boughs; but it was only to see whether, perchance, a fig or an apple had been left among them.

"A story! A story!" cried the children, pulling an old man towards the Tree.

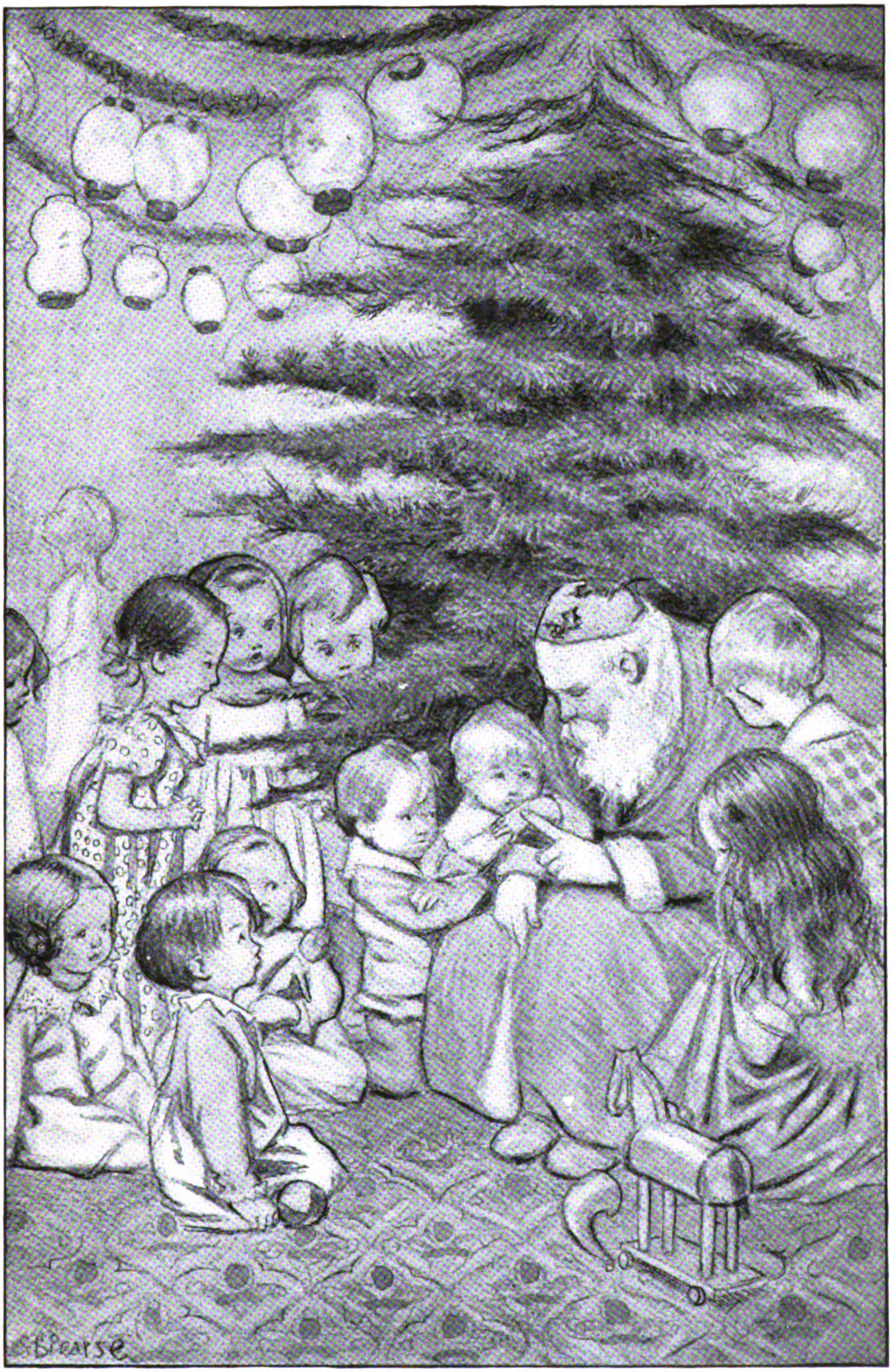
And then the old man told the story of Humpty Dumpty, who fell downstairs, and yet came to the throne and won the Princess. And the children clapped their hands. The Fir-tree stood, meanwhile, quite silent and thoughtful; the birds in the forest had never related anything like this. "Humpty Dumpty fell downstairs, and yet was raised to the throne and won the Princess!" "Ah, ah! Who knows but I may fall downstairs and win a princess?"

In the morning the maids came in.

"Now begins my state anew!" thought the Tree. But they dragged him out of the room, up the stairs, and into an attic-chamber, and there thrust him into a dark corner where not a ray of light could penetrate. "What can be the meaning of this?" thought the Tree. And he leant against the wall, and thought, and thought. And plenty of time he had for thinking it over, for day after day and night after night passed away, and yet no one ever came into the room. At last somebody did come in, but it was only to push into the corner some old trunks; the Tree was now entirely hidden from sight and apparently entirely forgotten.

"It is now winter," thought the Tree. "The ground is hard and covered with snow; they cannot plant me now, so I am to stay here in shelter till the spring. I only wish it were not so dark and so dreadfully lonely! Oh, how pleasant it was in the forest, when

# THE OLD MAN TOLD THEM THE STORY



**The old man told the story of Humpty Dumpty, who fell downstairs, and yet came to the throne and won the Princess. And the children clapped their hands. The Fir-tree stood, meanwhile, quite silent and thoughtful.**

the snow lay on the ground and the hares scampered about!"

"Squeak! squeak!" cried a little mouse, just then gliding forward. Another followed; they sniffed about the Fir-tree, and then slipped in and out among the branches.

"It is horribly cold!" said the little mice. "Otherwise it is very comfortable here. Don't you think so, you old Fir-tree?"

"I am not old," said the Fir-tree; "there are many who are much older than I am."

"How came you here?" asked the mice, "and what do you know? Tell us about the most delightful place on earth. Have you been into the store-room, where cheeses lie on the shelves, and bacon hangs from the ceiling, where one can dance over tallow candles, where one goes in thin and comes out fat?"

"I know nothing about that," said the Tree, "but I know the forest, where the sun shines and where the birds sing!" and then he spoke of his youth and its pleasures. The little mice had never heard anything like it; they listened so attentively and said: "Well, to be sure, how much you have seen! How happy you have been!"

"Happy!" repeated the Fir-tree, in surprise; and he thought a moment over all that he had been saying. "Yes, on the whole, those were pleasant times!" He then told them about the Christmas Eve when he had been decked out with cakes and candles.

"Oh," cried the little mice, "how happy you have been!"

The next night, the little mice came again and brought with them four other little mice, who also wanted to hear the Tree's history, and the more the Tree spoke of his youth in the forest, the more vividly he remembered it, and said: "Yes, those were pleasant times! But they may come again, they may come again! Humpty Dumpty fell downstairs, and yet, for all that, he won the Princess; perhaps I, too, may win a princess"; and then the Fir-tree thought of a pretty, delicate little birch-tree that grew in the forest, a real princess, a very lovely princess was she to the Fir-tree.

"Who is this Humpty Dumpty?" asked the little mice. Whereupon he related the tale; he could remember every word of it perfectly; and the little mice were ready to jump to the top of the Tree for joy.

But, at last, the little mice all scampered away, and the Tree sighed: "It was pleasant when they sat round me, those busy little mice, listening to my words. Now that, too, is all past! However, I shall have pleasure in remembering it, when I am taken away from this place."

But when would that be? One morning, people came and routed out the lumber-room; the trunks were taken away, the Tree, too, was dragged out of the corner; they threw him on the floor, but a servant picked him up and carried him downstairs.

"Now life begins again!" thought the Tree. He felt the fresh air, the warm sunbeams—he was out in the court. The court joined a garden. Everything was so fresh and blooming, the roses clustered so bright and so fragrant round the trellis-work, the lime-trees were in full blossom.

"I shall live! I shall live!" He was filled with delightful hope; he tried to spread out his branches—but, alas! they were all dried up and yellow. He was thrown down upon a heap of weeds and nettles. The star of gold tinsel that had been left fixed on his crown now sparkled in the sunshine.

Some merry children were playing in the court, the same who, at Christmas-time, had danced round the Tree. One of the youngest now perceived the gold star, and ran to tear it off.

"Look at it, still fastened to the ugly old Christmas Tree!" cried he, trampling upon the boughs.

And the Tree looked on all the flowers of the garden, and wished from his heart that he had been left to wither alone in the dark corner of the lumber-room. He called to mind his happy forest life, the merry Christmas Eve, and the little mice who had listened so eagerly when he related the story of Humpty Dumpty.

"Past! All past!" said the poor Tree. "Had I but been happy, as I might have been!"

And then the servant came and broke the Tree into small pieces, heaped them all up together, and set fire to them, and the poor Fir-tree was no more.

# BLACK DIAMOND

## THE LITTLE MARE THAT LIVED DOWN A MINE

She was a little black mare, black all over, with just a splash of white hair in the middle of her forehead. She had a black mane, a black tail, and black hoofs; but, because of the white splash on her brow, they called her Diamond.

She lived in Wales and her master was a corn merchant. She pulled his yellow cart with red wheels through green lanes and over mountain roads, carrying sacks of barley-meal from the mill to the shop, and sacks of corn from the shop to the farmers' houses. A great many people knew Diamond, and children in the neighbourhood very often played at being Diamond. They would run about with their heads bent down to their chests and their shoulders pressed forward, pulling at the toy reins which the driver held very tightly, while he said, "Whoa, Diamond; steady, Diamond;" and then they would stand still, pretending that they were waiting while the cart was being filled, and would toss their heads up and down, just like Diamond.

But one day, one cold, bitter winter's day, poor Diamond slipped on some ice as she came rattling downhill, and fell with a great, sickening thud on the road. The beautiful harness, with its red and white brow-band and its shining brass, split like string; the shafts snapped like firewood; the driver was pitched on his head and lay unconscious in the road; poor Diamond, with her knees bleeding and her beautiful soft nose all scratched and dabbled with grit and blood, rolled and kicked and groaned on the hard road, while one of the broken shafts pressed its jagged edges into her heaving flank.

There was nothing for it but to put Diamond out to grass.

"She shall have a foal and live light for a couple of years," said the corn merchant. And Diamond was turned out to grass. She had lived in this way for two or three months, when her master and a stranger entered the field one day. They had a good look at her, stroked her, felt her legs, ran their hands over her sides, examined her feet, and then walked slowly away talking money.

Diamond wondered what was going to happen. She was not long kept waiting. The very next day the two returned, a bridle was pushed over her ears, a rope was fastened to it, and she was led out of the field. A cart was waiting in the road. The strange man got up in this cart, and took the rope in his hand.

"She's a good mare," said Diamond's master, "and I'm sorry to lose her."

"She'll serve my purpose all right," said the other; and off went the cart with Diamond trotting behind.

They came presently to black and ugly country, with railway trucks and engines clanking over lines that stood up from the ground like furrows in a field, and then Diamond saw, in the open air, immense chimneys, and wheels with belting attached to them spinning round and round, and wooden huts, and piles of black coal and great banks of stones, and men with faces like niggers and clothes like chimney-sweeps, going constantly to and fro.

She was taken to what looked like a wooden shed, and there the man in the cart was joined by three or four others, who looked her over, stroked her, and pulled her ears. The men with black faces looked at her as they passed, and one of them called out: "Take your last look of the sun, old girl!" Some of the others laughed; some looked sad and passed on without speaking.

A bandage was tied over the eyes of Diamond. She could see only a dim and obscure light through this heavy covering. Someone patted her. "Come on, old lady," said a voice. She was led forward. She went nervously, feeling her way, and sniffing suspiciously. Someone was patting her side; the man who was leading her stroked her neck. Suddenly her feet struck on wood, instead of the ground, and she started to one side. "Steady, old girl, steady!" said two or three voices. The hand at the bridle pulled steadily forward. Diamond went on a step or two, sniffing and trembling, her flesh twitching with nervousness. "Whoa, then," said the voices. And she stood still.

She heard a heavy door shut behind her, and jumped to one side, crouching down with her hindquarters, her tail pressed between her legs. The man holding her bridle spoke to her and stroked her. Then he called out: "All right. Let her go."

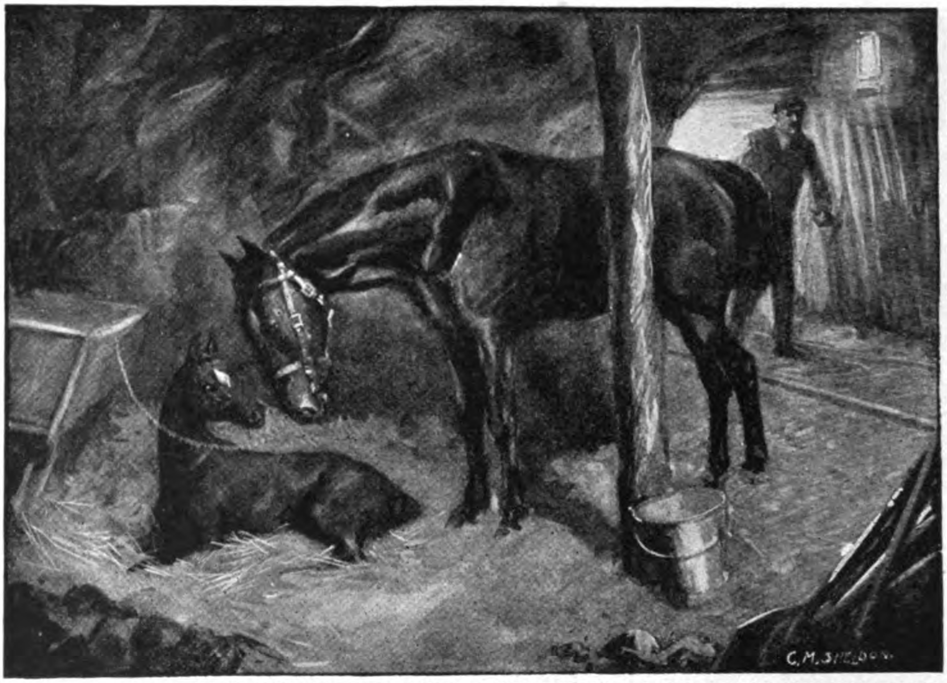
There was a pause; then the noise of a chain sounded, and Diamond felt herself falling through the earth. Down and down she went, and, in her fear, she plunged to this side and that side, blowing great clouds of steam through her trembling nostrils, while a thick sweat broke out from her heaving flanks.

"It's all right, Diamond," said the voice of the man; and his hand passed quietly over her neck and under her muzzle. When the bandage was taken off Diamond's eyes, she found herself in a perfectly black world, which was without grass or sky. She could see nothing. She could scarcely breathe. Then, as her eyes got used to this underworld, she saw that the place was a black tunnel, with walls, roof, and floor, and that, in the distance, a light was shining from a lamp.

She was led forward, and soon the light of many lamps fell on her, and she saw men moving, and heard the sound of voices. Someone came forward, took the rope from the man who had brought her down, and led her away.

Diamond felt less frightened when she saw another horse pulling a truck full of coal through one of the tunnels. She felt almost quite safe when she came to a stable where there were three other horses. The stalls were clean. There was plenty of straw about. The horses were well groomed and looked fat. They neighed a welcome to Diamond, and Diamond answered them.

She was given a handful of corn, but she was afraid of the manger and would not eat. The man brought some hay for her rack, but she started away from it. Then the man said: "Diamond, my dear lady, a man and a horse can get used to anything. You'll get as used to eating food underground as above ground, see if you don't." He began to pass a hay-wisp over her, and while he did so he said: "Now, just you listen to me, my pretty. I'm called William—that's the name you'll have to call if you want anything; just you say 'William,' and I'll be round in a second; my name's William, and I've been here a matter of seven and thirty years, and I never



BLACK DIAMOND TOLD HER BABY ABOUT THE WONDERFUL WORLD ABOVE THE COAL-MINE yet handled a horse that didn't get to love me. You've got to love me. I'm going to change your name to begin with, and call you Black Diamond, because you'll be dealing in black diamonds for the rest of your days.

"Now, it's a bit stuffy down here, I admit; and the dark tries the eyes, and you can't help missing the birds, and the trees, and the grass, and the skies, and the rivers, and the sight of children. But, lor bless you, Black Diamond, we can't all have the best of things. Some must live in palaces, and others in coal mines. Some must sail ships across the sea, and others must look after poor men in prisons. Some must go fighting, and others must sell woollen stockings. If everybody had everything, there'd very soon be nothing for nobody. And, come to think of it, my lass, you're a deal better off down here with old William than you would be pulling a cab through the streets of London or standing for an hour at a time in the rain outside Cardiff Station.

"Now, isn't that true? Come, taste these oats out of my hand, and see how good they are. You and I are going to be friends; we've got to be friends, Black Diamond. So let's begin at once, and enjoy ourselves."

Black Diamond learned that the love of the miner does make up, in some measure, for the loss of sunlight and heaven's sweet air. She grew to love her friend William. She pulled the coal-trucks through the black mine, and scarcely noticed that she was going gradually, gradually blind. William brought her apples and carrots in his coat-pocket, and the other miners made a pet of her, and she was soon a favourite with the other horses in the stall. "A pit's a poor place to live in," reflected Black Diamond; "but it's wonderful what a little love will do."

She worked grandly. She ate heartily. She slept soundly. But she was going gradually, gradually blind.

Then her foal was born, and the miners called it Little Diamond, and Black Diamond grew very happy, telling this black baby all about the wonderful world above the coal-mine. She had just sufficient sight to see her baby, and she would lick it for hours, with her poor, fading eyes full of great tears.

"I like hearing your stories," said Little Diamond; "but, of course, I don't believe they're true. They are only fairy stories, aren't they?"

And years afterwards, even Black Diamond herself came to think that the green earth, where she had spent so many delightful days, must be only a dream.

It is so difficult, when one is born in the dark, and lives in the dark, to believe that just a little way above there is a world bathed in sunshine and light.

## IDUNA AND THE GOLDEN APPLES

In the ancient days, the English people lived in a country between Denmark and Germany. They were then a fierce race of heathen warriors and seafarers. They loved the noise of battle and the hazards of adventure, and they worshipped savage deities of thunder and war. But though they were rough and wild, and scorned the arts of peace, they loved to hear songs about brave men and beautiful women, and this side of their character is shown in the stories they used to tell about Bragi and Iduna and the golden apples.

Bragi, the tall and comely god of poetry, dwelt with other gods in Asgard, a land of eternal spring, that shone with its golden battlements far up in the sunlit sky. Bragi had a harp with golden strings. When he took it in his hands, and began to sing to the music he made, all the gods put everything aside, and listened with delight to him. His voice was divinely sweet, and nobody could resist it.

Sometimes Bragi would come down from Asgard and wander about the earth. One day he sailed to an island where all the air was sweet with the flowers of spring. There he sang of the joy of life and the power of love; and, as he sang, a maiden, crowned with blossoms and leaves, rose up before him, among the flowering grasses and the budding bushes.

She was Iduna, the spirit of eternal youth, fair as the daybreak and pure as running water. She guarded the enchanted tree on which grew the golden apples of immortality.

When Bragi saw her, he sang with such joy that the sound of his voice filled the nine worlds. Then he stretched out his arms to Iduna and she came to him.

After they were married, they went to Asgard. The gods welcomed Iduna with joy, and she gave them some of her apples to eat, and they were filled with the gladness of immortal youth. Unhappily, an old and ugly giant, living in the bleak and wintry land of Thunder, heard of the arrival of Iduna at Asgard, and resolved to obtain one of her apples, so that he might eat it, and become young and beautiful. He seized one of the gods, Loki, who came near his domain, and held him a prisoner until he promised to bring Iduna to him. Loki returned to Asgard, and found Iduna alone, Bragi having gone off alone on a long journey.

"Come with me, Iduna, out of Asgard gate, and I will show you a tree that bears golden fruit resembling your wonderful apples," said Loki.

Iduna followed him, and Loki led her to the giant, who carried her off to the land of Thunder. For some time, the other gods thought Iduna had gone on a journey with Bragi. But some weeks passed, and their hair began to turn grey, and their faces to grow white and withered, because they had no apples of immortality to eat. They then began to search for her, and found that she was last seen walking out of the gate with Loki. The traitor then confessed, but promised to bring Iduna back if he were given a pair of wings.

His request was granted, and he flew swiftly to the land of Thunder, and there he found Iduna sitting very sad and lonely in a bare hut. Happily, the giant was away. But just as Loki began to carry Iduna back to Asgard, the monster appeared. He was very, very angry, as he had not succeeded in persuading Iduna to give him one of her apples. Putting on an eagle's dress, he rushed after the fugitives like a storm.

All the gods stood on the battlements of Asgard, anxiously watching the chase. Loki came along at a marvellous speed, but, as he neared the gate, the giant sprang upon him. He sprang too late, however, for the other gods came to the rescue, and slew him.

Iduna gave them all some of her apples, and they recovered their beauty and their youth; and soon afterwards Bragi returned, and sang a song of triumph, and all the gods were pleased.

IDUNA GAVE THE GODS SOME OF HER GOLDEN APPLES AND THEY RECOVERED THEIR YOUTH

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THE NEXT STORIES ARE ON PAGE 3641.

Boy scouts preparing dinner.

# THE BOY SCOUTS OF AMERICA

A boy is the most loyal being in the world. Undirected, his excess of animal spirits and sociability sometimes drive him into undesirable lines. He becomes the member of a " crowd " or " gang " and his very staunchness and unswerving loyalty to boyhood's unwritten law that requires him to stick by a comrade even when it leads him into a row becomes a peril to the community in which he lives.

Yet this sense of clannishness and high spirits which ordinarily result in lawlessness, in breaking the heads of " scabs," and in generally keeping the whole neighbourhood in an uproar, when directed into the proper channels becomes a splendid foundation for manly character.

Workers with boys have just begun to realise this fact. The day of suppression and of repression is past. Expression — wholesome, intelligent expression — is the motto of the age. If you would make men you must teach the boys to make themselves.

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## THE SONS OF DANIEL BOONE

Some thirty years ago Dan Beard was walking down a street in New York City when he was struck by the fact that nine-tenths of the boys he saw did not know how to properly spin a top or to play marbles skilfully. He investigated further and found that practically none knew how to make a kite that would fly or a balloon that would ascend.

" Our boys must be taught how to use their brains and fingers," he thought, and he set out to remedy the evil by writing books to teach boys handicraft and woodcraft. Later he organised out-of-door societies under the name of " The Sons of Daniel Boone," which was later changed to the " Boy Pioneers of America; " and so the germ of the Scout idea was set adrift in our country.

## THE WOODCRAFT INDIANS

In the meanwhile Ernest Thompson-Seton, the author of such well-known nature books as Wild Animals I Have Known and The Autobiography of a Grizzly, was working a similar idea out, along independent lines. Greatly impressed by the number of "flat-chested cigarette smokers with shaky nerves and doubtful vitality" that he found among our boys, he determined to counteract this degeneracy by substituting out-of-door clubs and athletics for tobacco and alcohol.

### THE "WILD CAT BAND" OF SETON INDIANS

He began his boy work in 1898. In 1902 he had several woodcraft societies going, but it was not until 1903, when he paid a visit to a friend in New England, that his real movement was set on foot. His friend had purchased several hundred acres of abandoned land, and was turning it into a beautiful country estate. Mr. Seton found that the neighbourhood boys deeply resented the intrusion of a stranger on what they considered their property and were doing all in their power to drive him out of the place. They destroyed fences, pelted sign-boards until they were tipsy and covered the gates of the park with hideous paintings. Mr. Seton thought about the matter. He had his theories upon boy nature. With his friend's permission he gathered together a lot of tents and canoes and food and made a camp on the shores of the little lake in the park. Then he quietly invited the boys of the nearby village to become his friend's guests for a few days' camping. They responded — at first half suspiciously and then with a turbulent outburst of animal spirits that made Mr. Seton's heart sink with inward misgiving. But he let them work off their excess of vitality, and after stuffing them with a dinner such as they had never had before, he gathered them around the campfire and told them stories of heroism and bravery; ending all with the tale of Uncas, the Last of the Mohicans.

Then in the breathless pause that followed, he remarked, reflectively, "Say, fellows, how are we going to do this camping out, just tumble around any old way, or real Indian fashion?"

"Oh, Injun, bet your life!" came the enthusiastic response.

Tactfully bringing all his knowledge of boy nature to bear on the task before him, Mr. Seton led them on step by step until that very night he accomplished his purpose and the "Wild Cat Band" of Woodcraft Indians was formed. The idea worked splendidly, for the erstwhile bandits of his friend's park slowly grew into a guard of staunchest supporters. Moreover they were the nucleus of many societies of boys that formed in tribes under the name of the "Seton Indians."

Mr. Seton's chief and most valuable contribution to the Scout movement consisted in the substitution of the honour idea for the competitive system, which by urging boys on beyond their strength had wrought so much harm in athletics.

### THE BOY SCOUTS OF GREAT BRITAIN

In 1904, Mr. Seton went to England to give public and private addresses upon woodcraft for boys. In 1906, he was joined in the work by Lieutenant General Baden-Powell of the British Army. General Baden-Powell remembered how in the siege of Mafeking in the Boer War, when all men had been needed on the firing line, the boys had been formed into little bands of messengers and had carried dispatches from fort to fort, and when the war was over had proudly received their medals with the grown-up soldiers. General Baden-Powell believed that the boys could be used successfully in times of peace as well as in war. He took Mr. Beard's Scout idea and combined it with Mr. Seton's Woodcraft Indian plan and in 1908 he set on foot the Boy Scout Movement of Great Britain.

General Powell gathered together a handful of English boys in Surrey. He gave them a little talk, such as had been given to the boy scouts of Mafeking, he put them in uniform and drilled them a little. Then he set them to playing at Indians and Knights of King Arthur, publishing a little booklet entitled "Scouting for Boys." The idea spread until now in Great Britain boy scouts can be seen everywhere — "in the slums

# BOY SCOUTS AT CAMP AND COUNCIL FIRE

**Here we see the Boy Scouts gathered around the Council Fire at the Woodcraft Camp of 1910, at Silver Bay, Lake George. Self-government and self-control are the aim of the Boy Scout movement. Its shibboleth is "Be Prepared," and so it aims to teach the boys to meet intelligently every emergency of life. There are medals awarded to boys who make themselves proficient along different lines, such as woodcraft, signalling, carpentering, first aid to the injured, swimming, running, in fact everything that will aid in making a boy an all around helpful man of the world. The movement started in the United States but a little over a year ago. Today there are 300,000 Boy Scouts in our country, and over 4,000 leaders of troops, or Scoutmasters.**

**Mr. Thompson-Seton, whom you see standing at the extreme right of the picture, is a well-known leader of the Boy Scout movement in the United States. He has a way of reaching boy natures that is wholly irresistible, and his word is more honoured among his "tribes" than were the laws of the Medes and Persians.**

of East London, in the loneliest country parishes, in towns and hamlets from Land's End to John O'Groat's."

### THE IDEA OF SERVICE

"Whenever anything happens—when there is a railway accident, a horse runs away, a house catches fire, or a man falls in the river, Boy Scouts seem to appear on the scene as if by magic, to make themselves useful in any and every way. How useful it may be to have on hand a trained and disciplined force of quick, intelligent boys in every emergency was seen recently at the time of a terrible railway accident on the London to Brighton railway. The local scouts, who were playing football, when they heard of the accident, rushed to the scene with their ambulance stretcher and for many hours calmly and promptly performed noble and terrible duties of rescue among the killed and wounded, giving most valuable help to doctors, public and railway servants. On the occasion of the late King's funeral procession through London a crowd of more than a quarter of a million people gathered. The rush was terrific and the heat was tropical; every minute a woman would faint. At every ambulance centre, Boy Scouts were in attendance, to aid the work of revival, carry patients, bring water and keep back the crowds. And when all was over and the crowd dispersed the Boy Scouts tidied Hyde Park of rubbish and scattered papers."

It is this idea of service—of doing something for somebody every day—which was added to the Scout idea by General Baden-Powell, and which immediately brought the movement to the attention of boy workers and has done so much to give it wide popularity throughout the English-speaking world.

### THE BOY SCOUTS OF AMERICA

In America the Scout movement was not legally incorporated until February 8, 1910. Since then it has progressed with marvellous leaps and bounds until now, in less than one year, there are 300,000 Boy Scouts in the United States and 4,000 leaders of troops called Scout Masters. Bands of Boy Scouts can be found in every state in the Union, in Panama, in Cuba, in Hawaii, in the Philippines. The movement is sweeping over the country with an enthusiasm and impetus even greater than in England. In fact, as General Baden-Powell recently stated at a dinner given him at the Waldorf Astoria, the vast stretches of territory, woods and streams — ideal camping grounds — give the movement a greater future in America than even England can ever hope for. Yet, wherever the movement spreads, it is "the magician's wand that turns boys into upright, honourable, chivalrous, kindly, self-reliant, useful and patriotic men."

### THE SCOUT LAW

On the Scouts' Law, which every boy must know by heart before he can become even a tenderfoot — the lowest grade of scout — hangs the whole glory of the scout idea.

The Scout Law in its present English form says: —

1. A scout's honour is to be trusted.
2. A scout is loyal to his country, his officers, his parents, and his employers. He must stick to them through thick and thin against anyone who is their enemy, or even talks badly about them.
3. A scout's duty is to be useful and to help others. He must try to do a good turn to somebody every day.
4. A scout is a friend to all, and a brother to every other scout, no matter to what social class the other belongs. A scout must never be a snob. A scout accepts the other man as he finds him and makes the best of him.
5. A scout is courteous. That is, he is polite to all, but especially to women, children, old people, invalids, and cripples. And he must not take any reward for being helpful or courteous.
6. A scout is a friend to animals, he should save them as far as possible from pain, and should not kill any animal unnecessarily. Killing an animal for food is allowable.
7. A scout obeys orders of his parents, patrol leader, or scoutmaster without question.
8. A scout smiles and whistles under all circumstances. When he gets an

order he should obey cheerfully and readily, not in a slow hangdog sort of way. The punishment for swearing or using bad language is for each offence a mug of cold water to be poured down the offender's sleeve by the other scouts. It was the punishment invented by the old scout, Captain John Smith, three hundred years ago.

9. A scout is thrifty, that is, he saves every penny he can and puts it into the bank, so that he may have money to keep himself when out of work, and thus not make himself a burden to others; or that he may have money to give away to others when they need it."

And so that loyalty of the boy which so often goes to waste is directed into wholesome, helpful, chivalrous channels.

### THE SCOUT OATH

Deeply impressed by the sense of the responsibility of his scoutship, the boy stands up, earnest-eyed and solemn, to take his oath.

"On my honour," he begins slowly, "I promise that I will do my best: First, to do my duty to God and my country; second, to help other people at all times; third, to obey the Scout Law."

And he raises his right hand level with his shoulder, palm to the front, thumb resting on the nail of the little finger and the other three fingers pointing upward, to make the Scout Salute.

### "BE PREPARED," THE SHIBBOLETH OF THE MOVEMENT

Before he became a tenderfoot he was taught how to make sailors' knots and learned the composition of the national flag and the right way to fly it. Once he has passed his test as a tenderfoot and has assumed the picturesque uniform for which his boy heart has been yearning, there are other interesting duties into which he is initiated. He learns first to give aid to the injured, to signal by means of the Morse alphabet or semaphore; to run half a mile in twelve minutes at scout's pace; to lay and light a fire with not more than two matches; to cook a quarter of a pound of meat and two potatoes without cooking utensils other than the regulation "billy can," and to know the sixteen points of the compass. Furthermore to qualify as a second-class scout he must be able to track half a mile in 25 minutes or to describe the contents of a store window from memory and he must have at least 25 cents in a savings bank. Before he can become a first-class scout there are other heights of scoutcraft to climb, all full of fascination to an active, healthy-minded boy.

And so the boys, bit by bit, learn endurance, self-reliance and self-control; they learn the secrets of the woods and fields and become possessed with an earnest, manly desire to be of service to some fellow human being every day.

### MANHOOD, NOT MILITARISM, AIM OF MOVEMENT

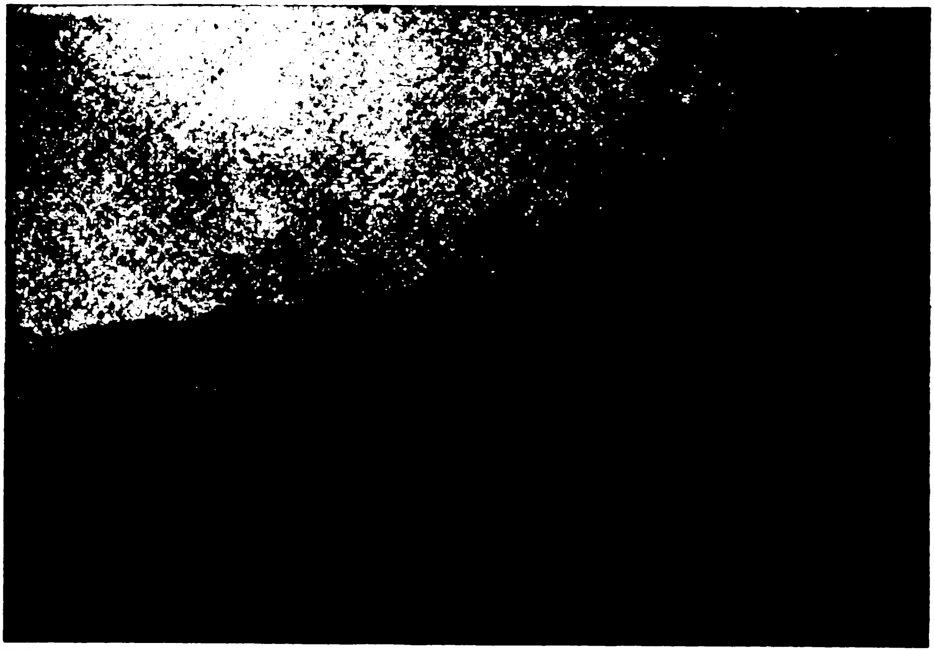
Not the least of the fine things about the Boy Scout movement is that it takes boys at their most critical age, between twelve and eighteen, and gathers them in from all conditions and ranks, levelling them by the standard of their common manhood.

The Boy Scout movement is not a military organisation in any sense of the word — neither is it a church movement. "A scout's religion is his own private business," Mr. Beard said recently in an interview which he very kindly granted to the writer of this article, "and it is not questioned by his officers or fellow scouts. The aim of the movement is to make honourable, useful, manly American citizens, and to do this without opposition of parents. All debatable ground is carefully avoided." And doing this, have we not laid the firmest foundation for the best and highest that there is in any religion?

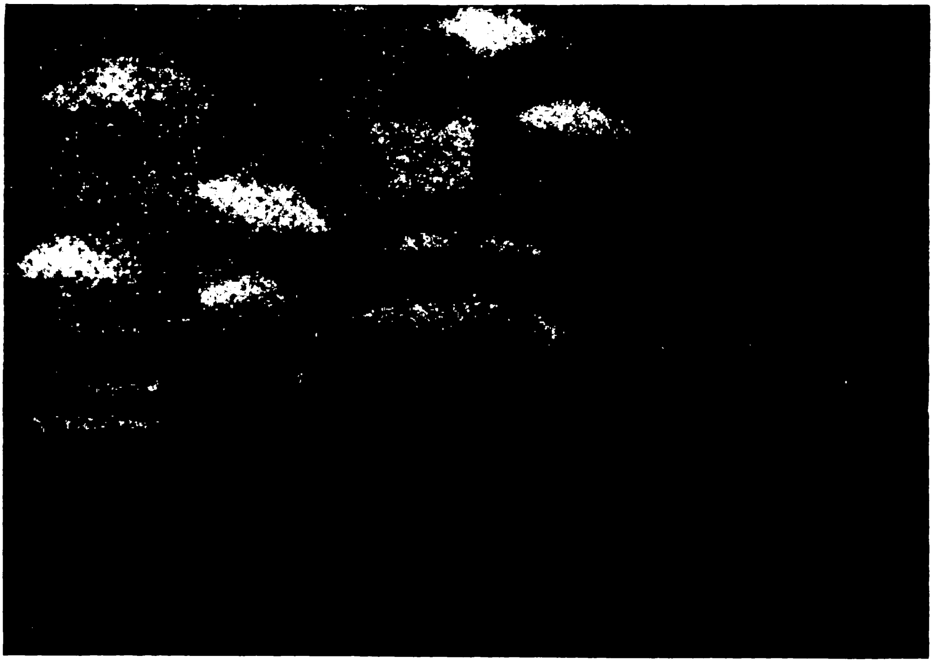
### THE YOUNG KNIGHT OF THE TWENTIETH CENTURY

As Mr. Blumenfeld so truly says: "All you have to do is to collect, say, a dozen boys, ragamuffins, young ruffians, boys of blue blood and boys of red blood, anything so long as it is a boy, teach him the Scout Law, put him on his honour, stick him into a uniform, and you have at once transformed the urchin into a blazing-eyed young knight errant, a chivalrous, honest, honourable, and zealous patriot." And yet there are people who disapprove of the Boy Scout movement!

# THE PAINTED DESERT



This is a picture of the petrified forest. In the background here and there can be seen fragments of the great stone tree trunks lying prostrate on the sand. These trees, which are composed of agate and chalcedony, have been lying here for nobody knows how many centuries since they were cast up from the bottom of the great American inland sea of long ago.



In the distance against the beautiful sky of the Arizona desert we see the peculiar terraced houses of a Pueblo Indian village built high upon a rocky, sandy mesa. These houses are built one upon another, each story one step back from the lower story, thus affording a shelf which is used as a courtyard and children's playground.

# THE FAIRYLAND OF ARIZONA

The call of the Wilderness — all who have been within the borders of the Painted Desert region have felt it — and yet, — what is it? At first, the desert of Arizona seems to us but a vast, dreary wilderness of barren sand and sky — " a land of lost rivers with little in it to love." It is a land full of dangers — danger of sunstroke from the scorching heat of the midday sun, of chill from the sudden cool of the nights, — danger of parching thirst, of fierce thunder-storms and of blinding sand-storms. Before us lie mile upon mile of inhospitable sandy wilderness and blunt, sun-scorched hills painted bright with glaring reds and browns and blues. The sky stretches above, cloudless and intensely blue; the air is filled with the glare of the sun until the landscape swims before us in waves of quivering colour. Here and there the waste is broken with patches of mesquite, of creosote, of sage-brush and of huge cacti, sometimes fifty feet tall, and queer, tricksy, ground creatures slink across the open spaces. Yonder a little bright lizard lies on the sand and pants, and enjoys the sun. The painted lizard and the deadly desert rattlesnake, called the side-winder because of its sidelong motion, alone of all the desert creatures seem to deliberately seek the torrid heat of the sunny places.

As we pass along we see here and there a sparrow or a hawk with beak drooping apart in the scanty shade of a desert shrub. One writer prettily tells her experience with the small folk of the rainless regions.

## THE BIRDS WHICH KEEP THEIR EGGS COOL

" The quick increase of suns at the end of spring sometimes overtakes birds in their nesting," she says, " and effects a reversal of the ordinary manner of incubation. It becomes necessary to keep eggs cool rather than warm. One hot, stifling spring in the Little Antelope, I had occasion to pass and repass frequently the nest of a pair of meadow-larks, located unhappily in the shelter of a very slender weed. I never caught them sitting except near night, but at midday they stood, or drooped above it, half fainting, with pitifully parted bills, between their treasure and the sun. Sometimes both of them together with wings spread and half lifted continued a spot of shade in a temperature that constrained me at last in a fellow feeling to spare them a bit of canvas for permanent shelter. There was a fence in that country shutting in a cattle range, and along its fifteen miles of post one could be sure of finding a bird or two in every strip of shadow, drooping and gasping in the white truce of noon."

In the summer the heat is intolerable — often 125 degrees in the shade, and a piece of metal that has been lying in the sun cannot be touched by the bare hand for it would raise blisters.

## THINGS IN THE DESERT ARE NOT WHAT THEY SEEM

If we have been wise we only enter this desolate land on horseback, for in the clear, dry air distances are very deceptive and people on foot often wander farther than they realise and sometimes become lost in the desert for days at a time.

As we ride along a sudden puff of hot wind whirls a cloud of alkaline sand into our eyes and nostrils and for a moment we choke and blink violently. What unbearable, stinging, inflaming stuff it is — that sand. In the violent, tornado-like sand-storms which sometimes overtake travellers in the Painted Desert, people are very apt to be smothered or buried in the sand. The only

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hope lies in tightly wrapping one's head in a blanket and keeping quite still until the storm is over. In these terrible sand-storms whole sand hills are sometimes torn out of the earth and whirled across the country. As someone laughingly said, if you would buy land in Arizona, you must see that it is safely anchored or you will wake up one morning to find that it has been transported into the next county.

### THE SAND-STORMS AND THEIR DANGERS

Quite a number of people are lost in these sand-storms each year, and their flesh becomes food for the carrion birds that are always hovering somewhere in sight in this desert land. We catch a glimpse of some buzzards circling in the distance and shudder a little, for wherever death overtakes a man or beast, these birds may be found, slowly circling lower and lower — waiting to swoop down hungrily the first moment the breath is out of the body. "When Jimmie O'Shea was lost on the Armoyossa Flats for three days without water, Tom Bassett found him, not by any trail, but by making straight away for the points where he saw buzzards swooping. He could hear the beat of their wings, Tom said, and trod on their shadows, but O'Shea was past recalling what he thought about things after the second day."

We meet a man in a covered wagon, driving a team of oxen. Slowly, patiently, they come along, and as they lift their feet from the blistering sands they utter a low bawling sound of pain. The man in the wagon draws up for a moment to speak to us. He tells us as he lifts his wide-brimmed hat a little to wipe the beads of perspiration from his red face, that men driving mules through the desert often give them whiskey to fortify them against the deadly heat. He says he thinks he is going to leave the land. "It is too damned hot!"

### THE CHANGE THAT FOLLOWS THE COMING OF THE RAINS

He may go, but he will come back. They all do — "miners and cattle-men, cursing the land and going back to it," for though the desert takes its toll of men, it has awild elusive lotus charm. The sun-scorched hills are luminous and rainbow tinted in the morning mists; the wilderness has its bits of tender green where silver threads of springs bubble up and flow out into the desert to be gulped down by the thirsty sands. True, — it is a land of arid wastes, — yet a single spring shower in a night will make the "desert blossom like a rose," and people wake to find stretches of tender grassy blades where before had been only sand — and in the grass are a multitude of blossoms — pink, pale blue, crimson and palest gold. We live a week or two in the desert seemingly so fierce and relentless, — and behold, — the tender witchery of the land holds us fast and when we go away it is not of the waste we think, — of the thirst, of the storms, of blinding sand and of drenching rain; but we remember the rainbow hills in the bluish morning mist, the glorious colours painted lavishly on hill and sand by Nature's Master Painter, the desert air after a storm has swept it clean — cool and crisp and intoxicatingly sweet — "the divinest air to be breathed anywhere in God's world." And this is the call of the desert.

### A FOREST OF SOLID STONE

In one part of the Arizona desert, we come to the petrified forest — which is a part of the fascination of this strange wild land. On every side lying about us are great stone trunks — pine trees of agate, and of chalcedony. At our feet lie thousands of chips of amethyst, of red agate, of smoky topaz.

The story of these trees of agate and of chalcedony is but another wonder tale of the fairyland of the desert. Long, long years ago — so long that no man was on the earth to see the miracle — a giant forest reared its head upon the place where these trees lie. Then a mighty sea rushed in and covered the forest. Year after year the forest lay at the bottom of a sea which was full of mineral salts, until at last the decaying logs became petrified into stone and another earthquake heaved the bottom of the sea once more into the open air and bit by bit the rains of many seasons laid bare this wonderful fairyland forest.

This photograph of the sun shining at midnight was taken in Norway when it was as light as day.

# NORWAY, SWEDEN, & DENMARK

CONTINUED FROM 3464

Once upon a time, the very far-off time when the British Isles formed part of the continent of Europe, the great Alpine heights were linked with the Northern Sea by a river much longer and fuller than the Rhine is now, for its mouth was between Scotland and South Norway.

As ages went on, the land rose, though not very much, as we read in the story of Holland and Belgium, but enough to give shape to the shallow North Sea, more or less as we find it now, washing the shores of Great Britain, Holland, and Denmark.

Denmark is one of the very few peninsulas in the world that point northwards. Its surface is flat; in some parts it has to be protected from the sea by dykes, as in the case of Holland. The islands that lie to the east of it form stepping-stones to the great peninsula of North Europe, which is more than five times the size of England and Wales. This is called the Scandinavian Peninsula, and stretches southwards from its northern neck of union with the continent for over a thousand miles, till it almost touches the islands of Denmark. A great backbone of mountains runs down the length of the peninsula, many of the heights of these Scandinavian Alps being between six and eight thousand feet. There is a long, gentle slope, with numerous rivers and lakes draining eastward to the Baltic, and a steep, short slope westward to the Atlantic. The Baltic has been called the Mediterranean of the North, so useful has it always been as a highway of communication for the people dwelling on its shores. The mountains divide the peninsula into two distinct countries—Sweden to the east, and to the west Norway, slung like a bag on the shoulders of Sweden.

In the Prehistoric Room at the British Museum is to be seen part of a kitchen dust-heap from Denmark, thousands of years old. In it can be distinguished oyster-shells, bones of birds, worn-out stone knives, and good ones too, for people even then were sometimes careless. These rubbish-heaps, with their tale of hard living on wind-swept shores, were formed by some of the earliest dwellers in North Europe. Others have left traces of their presence in the weapons and tools of stone found in different parts, and in their burial mounds; while to rather later times belong the treasures of metal objects and carved stones now so carefully collected and studied.

From the heart of Asia, a few centuries before the birth of Christ, there came the great Teutonic, or German, family of peoples. Some settled, as we see on page 2521, in the body of

Europe; others pressed on to the peninsulas and islands of the North, gradually driving the older peoples whom they found there—the Finns and the Lapps—farther and farther to the frozen North, where their descendants are found to this day in Finmark and Lapland, between the head of the Baltic, that is called the Gulf of Bothnia, and the Arctic Ocean.

### HOW THE NATIONS OF SCANDINAVIA GOT THEIR PRESENT NAMES

The newcomers, who became known as Scandinavians from the name of a province, Scanea, settled in what is now the extreme south tip of Sweden; and the names of Swedes, Danes, and many others come from the leading tribes that settled in various parts. The name Norsemen, or Northmen, comes from the position of the country in which these hardy folk found their home, in the north-way between ocean and mountain.

The Romans, as we have seen, did not push their conquests farther north than the mouths of the Rhine, and any Roman remains found in Scandinavia were carried there in the course of trading. And so all the long years when the Romans were setting in order Gaul, Spain, Germany, Britain, and leaving lasting traces in these countries, the Scandinavian peoples were working out their own development in their own way, in the fertile fields of Denmark, on the peninsula of Jütland and the neighbouring islands; by the grand, clear lakes and rivers and the boundless forests of South and Middle Sweden; and round the wonderful inlets of the sea in Norway, called fjords or fiords, like the firths so common in Scotland.

### THE NORTHMEN, WHO THOUGHT THUNDER WAS THE PASSING OF THEIR GOD

The religion of the Scandinavians was much like that of our own forefathers, their next-of-kin. Like them, when they saw the bright rainbow in the sky, they believed it was the bridge by which the gods rode to their home, Asgard; and when they heard the roar of the thunder, it was to them, Thor the Strongest rattling past on his cart or banging his great hammer. Like the Angles and Saxons, too, they believed that the great All-Father Odin, or Woden, received all slain in battle to feast for ever in his great hall, Valhalla. For war was their principal occupation, and the chiefs went on fighting each other for possession of desirable tracts of land that gradually grew into small kingdoms. At last, towards the close of the eighth century, some 300 years after their cousins had migrated across the sea to Britain, a sudden activity stirred in the hearts of the dwellers of the fiords, and some of their neighbours in Denmark or Sweden. It seemed as if they were tired of fighting each other, and longed for a wider field for adventure and glory. And so the Norsemen burst like a destructive tempest over lands, by this time somewhat civilised and Christianised, on the coasts of Ireland and Scotland, on the groups of islands near them, and on the coasts of England and France.

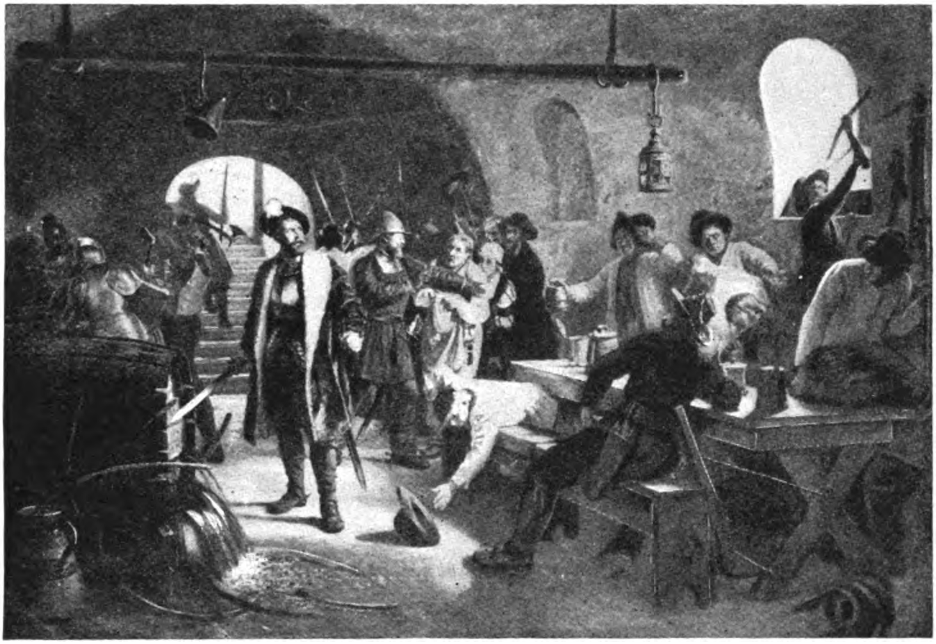
"From the rage of the Norsemen, deliver us, O Lord!" was the prayer that rose up from far and near, as churches and farms were burnt, and people were killed or enslaved, while their worldly goods were carried off to the ships of the Vikings, the fierce men who lived by the creeks or fiords.

### THE STIRRING STORIES AND INSPIRING SONGS OF THE VIKING HEROES

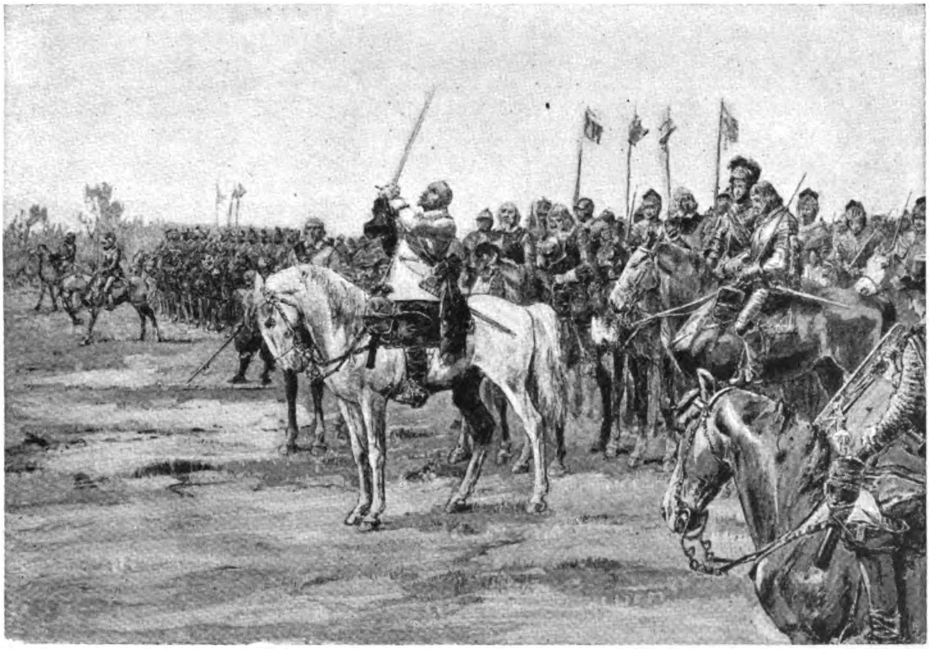
For a time they were content to depart with their booty, returning year by year for more; and then they began to settle in the attacked countries. We see in the story of France, beginning on page 2063, how Rollo founded Normandy, and how sadly Charlemagne watched the Norsemen in the Mediterranean. Other Norsemen settled in Iceland, and the islands to the north of Scotland, and in Ireland, where their descendants are still known by their Scandinavian names and appearance.

Beyond once sailing up the Thames, the Norsemen seem to have left England chiefly to the Danes, about whose struggles with Alfred we read on page 430. The stories of these times are related by poet-historians, whose writings, or sagas, have been handed down, and collected, and greatly studied. They give so many particulars of vivid scenes and stirring conversations between the heroes, of their garments and songs, of their bravery and feasting, that they make the wild old times live again, those times when the rusty old swords and spears we see in museums were new

# THE HERO-KINGS WHO MADE SWEDEN GREAT



**Gustavus Vasa, the deliverer of Sweden, was crowned king in 1523, and under him Sweden became a Protestant nation. He was a good king, hated drunkenness and gluttony, and did much to elevate his people. In this picture, by the famous Swedish artist Saloman, we see him engaged in his crusade for pure living. He has come suddenly upon a drinking party of his subjects, and has with his sword destroyed a barrel of liquor.**



Few monarchs have been so gifted as Gustavus Adolphus, the hero-king of Sweden. He spoke and wrote eight languages, was a clever statesman and a brilliant general. When he became champion of the Protestants of **Germany, he soon made the emperor's forces fear the "Snow king and his bodyguard," as they called the Swedish monarch and his small army. Gustavus was everywhere victorious, but at the battle of Lutzen, in 1632, although the Swedes won, their king was slain. Here we see him praying for victory before the battle.**

The photographs on these pages are by J. Valentine, Underwood & Underwood, London, The Photochrome Company, and others.

and bright, and the drinking-horns, which could not be set down till they were empty, were filled, again and again, at feasts where the warriors "tumultuously rejoiced"; and the combs were used to straighten the flowing locks of the Freemen. There is one of these combs at the British Museum with the inscription "Thorfast made a good comb."

### THE TERRIBLE NORSEMEN, WHO BROUGHT NEW LIFE TO THE OLDER NATIONS

These Northmen, terrible as were their descents on the countries they attacked, infused a breath of new life into them which has lived on. They had a wonderful power of adapting themselves to the manners and speech of the people among whom they settled. In Normandy the Northmen became French; in England we know how the Danes mingled with the English.

In the meantime, in the big and little peninsulas, and on the islands between them, the three kingdoms were gradually settling down, and for about four centuries, from the tenth to the fourteenth, they kept fairly distinct and independent of each other, though for a time the kings of Denmark, Sweyn and his son, Canute the Mighty, were practically emperors of the North, ruling not only over Denmark, Norway, and part of Sweden, but, as we read on page 434, over England across the sea.

Sweyn's father had adopted Christianity for Denmark. In Norway, about the same time, there were two kings named Olaf, whose doughty deeds forced Christianity on their unwilling people. The second Olaf, with the flaming red beard, is St. Olaf, the great hero of Norway, for his adventurous life, and still more his tragic death, took firm and lasting hold of the imagination of his fierce countrymen.

### OLAF, THE HERO-KING OF NORWAY, WHO FACED THE ANGRY PEASANTS

After helping Ethelred of England against the Danes, he bided his time till he could establish his claims to his father's throne. Facing the angry peasants, who objected to his reforms, he struck down their idol with his club, and after many and wonderful adventures, amid loud battle-cries of "Forward, Christ's men, Crusaders, the king's men!" and "Forward, forward, peasant men!" Olaf fought his last desperate fight on August 31, 1030. The date is fixed, because as the king died there was a total eclipse of the sun, terrible to the peasants, who thought it a sign of God's anger. St. Olaf was buried at Nidaros, at the mouth of the Nid, on the Trondhjem Fiord.

It was in the days of the Olafs that Leif the Lucky sailed away to the West, and first showed Greenland and the shores of North America round the mouth of the St. Lawrence river to Europe.

Another name stands out in these early days—that of Sverre, who led the Birchlegs, so called from the bark they bound round their legs, against the Baglers, who represented the Church and nobles, in wild contest for the kingdom. The bravery of Sverre and his Birchlegs was splendid; the old historians tell us how Sverre put down the nobles who oppressed the people, and how he maintained law and order, after long and fierce fighting by sea and land, between the old towns of Bergen and Nidaros. The Pope excommunicated him, but Sverre defended himself.

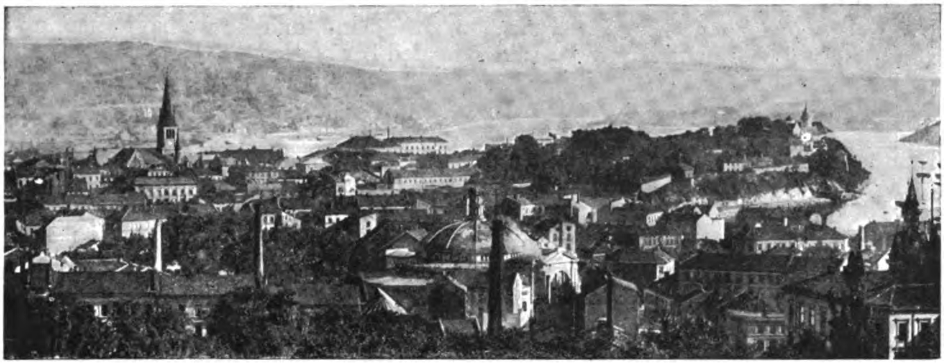
### THE CAPTIVE CHIEF WHO TOLD A DYING KING THE WONDERS OF THE EAST

The Bagler chief with whom he last fought had been on a crusade to Constantinople and Jerusalem, and when the two, both ill, were lying side by side on the ship's deck that was taking them to Bergen, as they gazed at the clouds fleeting across the wintry sky, the conquered Bagler told his conqueror, Sverre, about his wonderful adventures in the East, and of the glories of Constantinople. Sverre died on landing. He was one of the greatest kings that ever ruled over Norway.

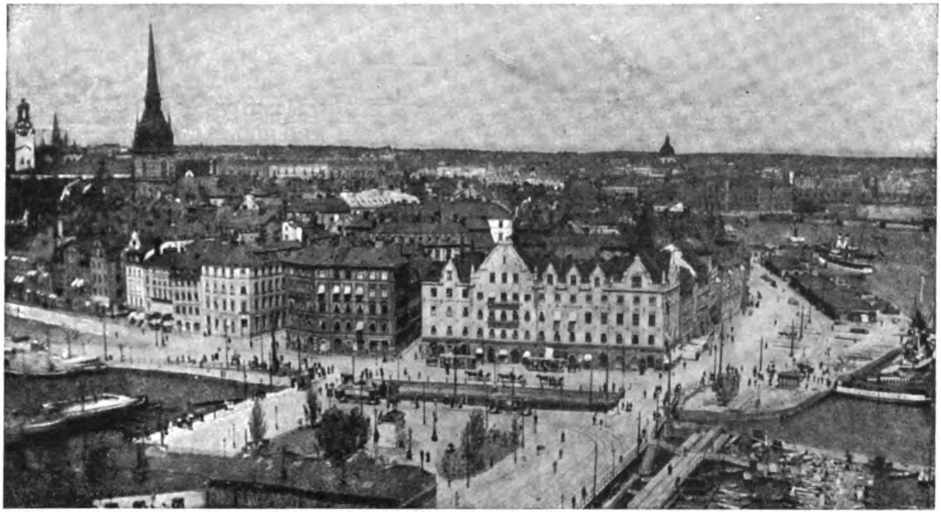
Two centuries after his death, all three kingdoms were united for over 150 years under the rule of Denmark. This time was marked by many struggles among the three kingdoms and also by wars with the Hanseatic League, which had become very powerful. Besides stations in Germany, the League had several in Scandinavia.

Norway suffered terribly from the plague called the Black Death, brought by an English merchant to Bergen. Whole populations were swept away, and centuries passed before the country fully recovered from the loss to trade, and agriculture, and progress. Sweden broke away from the Union of Calmar, as it was called, when its great king,

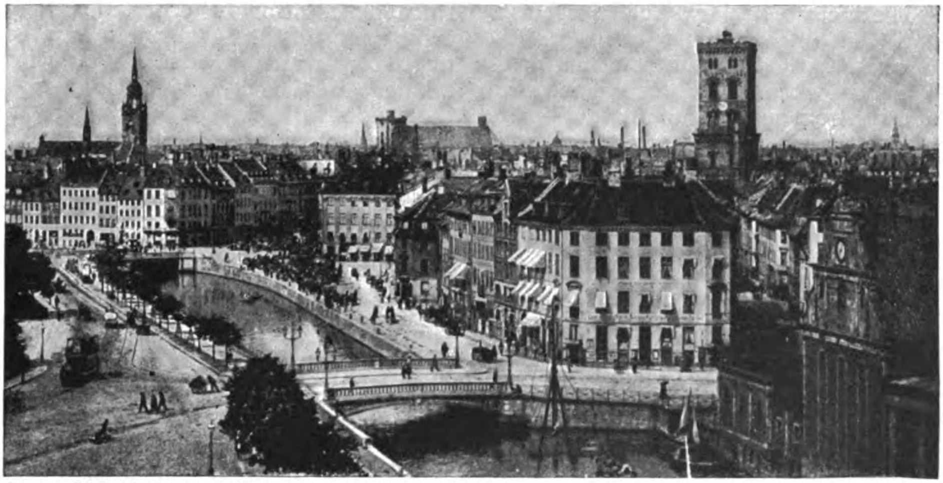
# THE THREE CAPITALS OF SCANDINAVIA



Christiania, the capital of Norway, named after King Christian IV., who founded it in 1624, is situated amid beautiful scenery. It is growing in importance every year. This view of the city is taken from the king's palace.



Stockholm, the capital of Sweden, is built upon islands, and the name means "an island in a sound." For several months every year the harbour is closed by ice. In this picture, showing the Sluice Bridge, we are looking north.



Denmark's capital is one of the finest seaports on the Baltic Sea, and its name of Copenhagen means "the haven of the merchants." It has a very considerable trade, and is the only first-class fortress in Denmark.

Middle picture copyright by Underwood & Underwood, N. Y.

Gustavus Vasa, rose to power. The union between Denmark and Norway went on for another 300 years. During this time Norway may be said to have no history. It was miserably oppressed and powerless. For in Denmark, for some time, the king was but the tool of the nobles, who ruled as they chose in both kingdoms. In the year of the Spanish Armada, 1588, King Christian IV. became King of Denmark and Norway, and during his long reign matters considerably improved.

Christian IV. was a very energetic king, and travelled over his kingdom right up to the Arctic Circle, punishing officials who were doing wrong. He found time, too, to visit at Greenwich his sister Anne, who married James VI. of Scotland, afterwards James I. of England. His portrait hangs at Hampton Court. He was also a great builder. Christiania, now the capital of Norway, and Christiansand, a port on the south of Norway where many steamers touch, were founded by him.

### THE WEALTHY NOBLES WHO REFUSED TO PAY THEIR TAXES

He had much trouble with the nobles of Denmark, who, though very wealthy, refused to pay their share of the taxes. When his son came to the throne, the Royal Council, composed very largely of incompetent nobles, was done away with, and the king became absolute, ruling without a constitution. Denmark lost that same year, 1660, the land she held in the south of the Scandinavian Peninsula.

The duchy of Schleswig, chiefly Danish, and the duchy of Holstein, chiefly German, to the south of the peninsula of Jütland—which had for years been shifting from one ruler to another—were at this time wholly united to the Danish crown. This period, while Denmark and Norway were united, was the time of Sweden's greatest glory, followed, unhappily, by a time when the gains of its hero-kings were nearly all lost again. Gustavus Vasa adopted the Protestant teaching of Luther. Though some people lost their lives, the changes in religion came about more quietly in the northern kingdoms than elsewhere. Gustavus Vasa's famous grandson, Gustavus Adolphus, was the "Snow king" of the Thirty Years War, and gained lands from Germany both on the Baltic and on the North Sea. In the time of Charles XI., Sweden gained Livonia from Poland, and, as we have seen, extended her borders to the extreme south of the Scandinavian Peninsula, which gave her ports beyond the narrow entrance of the Sound to the Baltic.

### THE SWEDISH KING WHO ASTONISHED THE WORLD BY BEATING THREE NATIONS

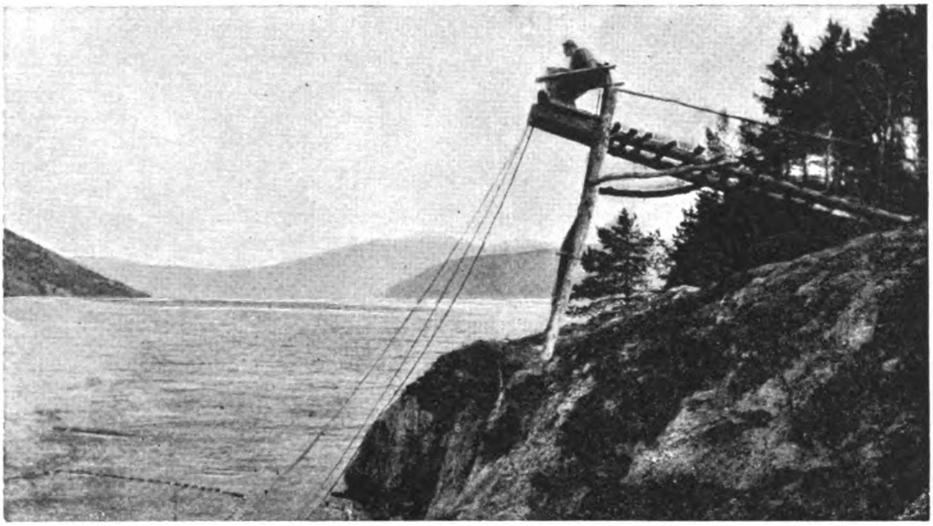
Charles XII. won victories which astonished the whole world. Attacked by Denmark, Poland, and Russia, all at once, he beat all three, though at last he was defeated by the Russians. His reign was nearly all war, and the kingdom was taxed beyond its strength to provide men and money. Still, though it lost a great deal in later reigns, it has always kept its valuable gain from Denmark on the south of its own peninsula. Wars with Russia followed, and many revolutions took place, kings and nobles claiming absolute power in turn.

In the wars of Napoleon, Denmark had to be on the side of France, and in 1802 the English felt obliged to bombard Copenhagen and seize the Danish fleet. Sweden took the part of the allies, and its crown prince, Bernadotte, one of Napoleon's generals, led the Swedish troops against his old master when, in 1813, all Europe was struggling to regain freedom. When peace was made, it was arranged that Denmark should no longer be under Norway, but that the two kingdoms of the great Scandinavian Peninsula should be joined together under one king. To this the Norwegians strongly objected; they chose a king of their own, and set up the freest constitution that is possible with a king. In the end they had to accept the union with Sweden, joining as an independent kingdom, to be ruled according to its own free constitution.

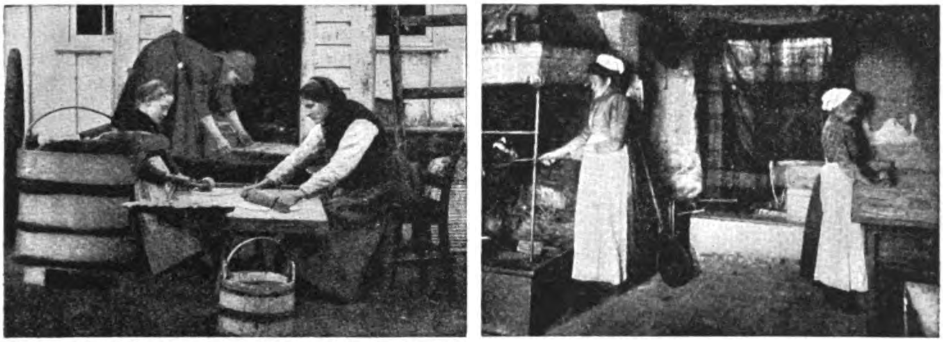
### HOW PRUSSIA SEIZED TWO PROVINCES THAT BELONGED TO DENMARK

Denmark still remained an absolute monarchy till the great revolutionary year of 1848, when Frederick VII. gave his people a constitution. There have been endless disputes about the two duchies at the base of the peninsula, and we see, on page 2579, how they were seized by Prussia, and, on page 2750, how the great Baltic Canal was cut across Holstein, connecting the Baltic Sea with the North Sea.

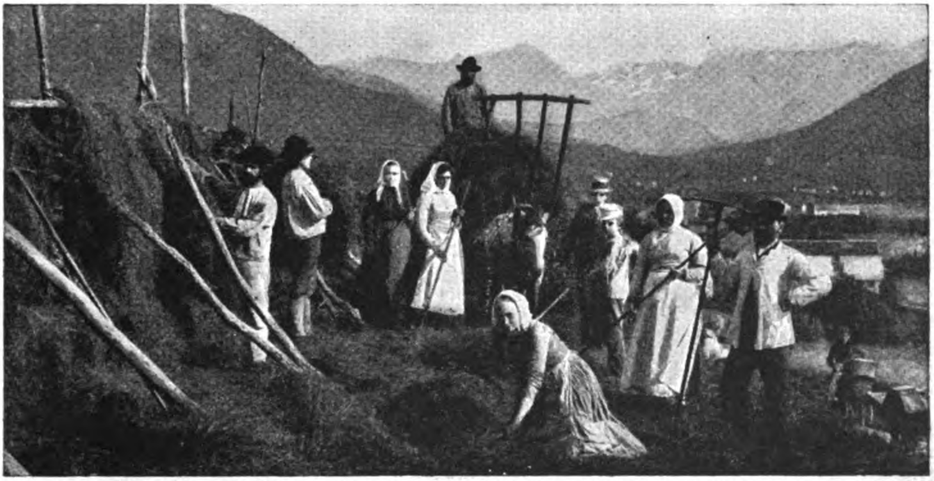
# THE PEOPLE OF SCANDINAVIA AT WORK



**The fiords of Norway, with their deep waters and rocky walls, are excellent for fishermen, and such sights as this are common, the fisher sitting in a "crow's nest," built on poles, from which he watches his lines or nets.**



The people of Sweden make their bread in the form of **flat cakes, which they call flat-bread, and this is in many parts the principal diet of the people. In the picture on the left we see flat-bread being made in the open air, and on the right a farmer's wife and daughter are making and baking similar food in the kitchen of their farmhouse.**



Norway is not a leading agricultural country, its principal industries being timber and fishing. But agriculture has been much developed of late years, and here we see a party of Norwegian haymakers at work in the fields.

The Swedish crown has remained in the family of Bernadotte, who became king as Charles XIV., and improvements have been made in the Swedish constitution, and more freedom and liberty have been granted to other forms of religion besides the Lutheran.

### THE BRITISH PRINCESS WHO BECAME QUEEN OF AN INDEPENDENT NORWAY

But Norway ever kept the vision of independence before it, and in 1905 succeeded in its aims and separated from Sweden, choosing for its king a Danish prince who has taken the name of Haakon, so full of associations with early Norwegian history. His wife is a daughter of Edward VII., and the little crown prince bears the revered name of Olaf.

And now all three Scandinavian kingdoms are as independent of each other as they were at the beginning of their history; there was a century and a quarter of the Calmar Union of all three, nearly three hundred years of union between Denmark and Norway, and nearly a century of union between Sweden and Norway.

Six hundred miles away from Norway lies the large island of Iceland, many times larger than Denmark, to which it belongs. Settled by Norsemen in very early days, it was a possession of Norway when that country passed under Denmark. When Norway was united to Sweden, Denmark kept Iceland. The climate is so cold, and it is so difficult to grow food, that there are very few people living there. Fishing is their chief occupation. Many visitors go in summer to Iceland to see the fine volcano, Mount Hecla, and the boiling springs, or geysers, near it. These are somewhat like those in New Zealand.

### THE BUTTER FROM DENMARK THAT IS SPREAD ON BREAD FROM CANADA

Denmark owns, too, the mountainous Faroe Islands, midway between Scotland, Iceland, and Norway, where sheep feed, and wild birds circle round the tall cliffs, and the inhabitants live a primitive life. To Denmark itself, it is a very easy journey from England across the North Sea to the chief western port, Esbjerg, and then by train across the green meadows of Jütland and the islands, and by boat across the arms of the sea that lie between them, to Copenhagen, on the east coast of Zealand, facing Sweden. This chief passage is called the Sound. Other passages are the Great Belt and the Little Belt, and lines of steamers are constantly plying between the islands and to the German coast, and by the great canal from Kiel Bay to the mouth of the Elbe.

Denmark is one of the most famous countries in the world for dairy farming; the meadows are so rich, and the people are so careful and progressive in their methods, that their butter is excellent. Large quantities are exported. Many Danes go to Siberia, where vast farms are gradually rising up over the country, In England Danish butter is used with bread made from the wheat of Canada.

Copenhagen, the haven of merchants, has very fine harbours and quays, and has been the capital of Denmark for many centuries. The popular King Christian IV. added greatly to its importance, and it has very interesting museums and picture-galleries. In the Danish Museum are collections of both prehistoric and historic objects, illustrating all time.

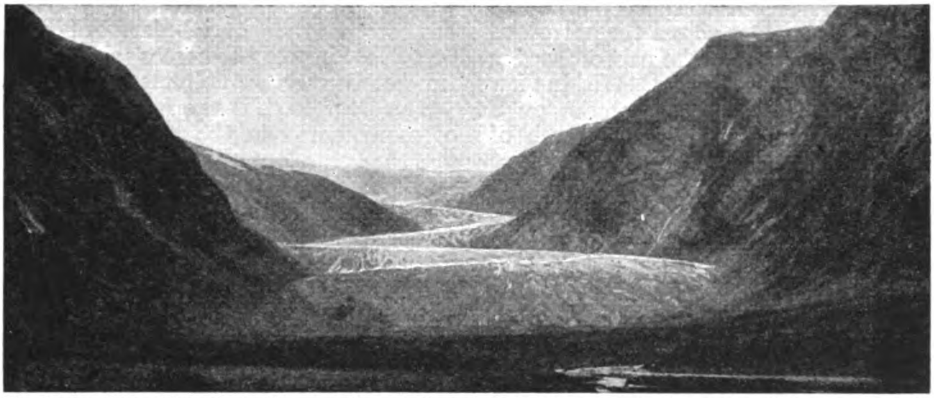
### A DANISH AUTHOR WHOSE TALES DELIGHT THE CHILDREN OF THE WORLD

The porcelain factory is famous for its beautiful work. Among the statues of men held in remembrance by Denmark, such as Christian IV. and Frederick VII., who granted the Constitution, is that of Hans Christian Andersen, the friend of children throughout the world, whose beautiful fairy stories have been translated into many languages.

Copenhagen and its surroundings are interesting as the early home of Queen Alexandra. The Denmark monument which commemorates the golden wedding of her father and mother, shows the widely-spread influence of their children in the courts of Europe. There is on it a picture in relief of the marriage of their daughter, Princess Alexandra, with the Prince of Wales, later Edward VII.; another of the departure of their second son to ascend the throne of Greece as George I.; another of the marriage of the Princess Dagmar with the Russian prince, afterwards Tsar Alexander III.

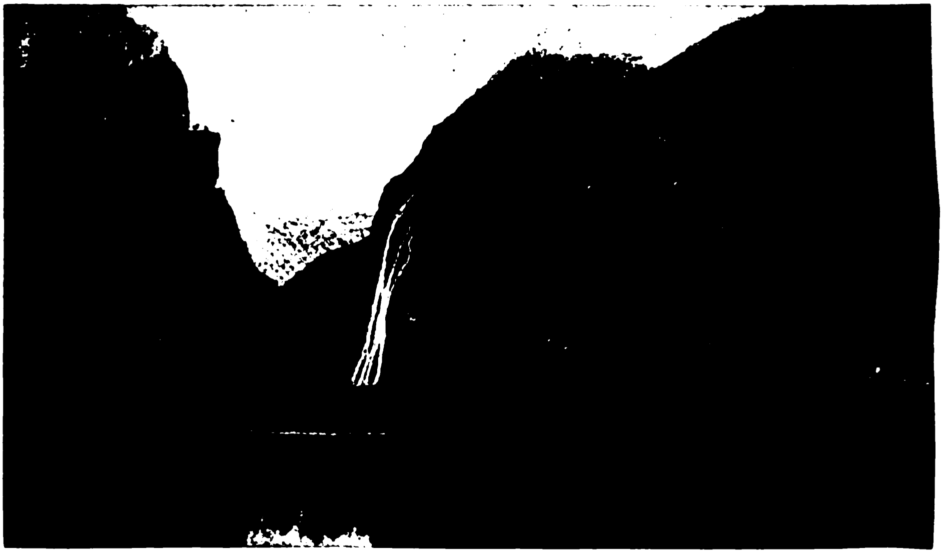
We cannot leave Denmark without a visit to its older capital, Roskilde. It is now an important railway centre. Of its ancient glory, the cathedral is the sole relic, containing the tombs of the Danish kings from the tenth century.

# THE GLACIERS AND FIORDS OF NORWAY



The famous Jostedal glacier in Norway, after winding about as seen in this picture, is said to discharge into the waters of the Sogne Fiord, together with its ice, no less than a thousand tons of gravel and stones every day.

For snow and ice scenery, Norway rivals Switzerland, though there is a marked contrast. In Switzerland the glaciers form amid spiry crests and sharp peaks, while in Norway they are born on lofty tablelands. In the left-hand picture we see a glacier on Lake Olden, glittering among the drifting clouds, and on the right the winding road of Griotlid. In the middle picture tourists are playing at snowballs at midsummer on the Kaukeli Mountains.



Norway is noted for its fiords, or deep inlets of the sea, that penetrate far inland. The Geiranger Fiord, seen here, is a typical example, and large steamers can navigate the narrow channel between almost upright walls of rock. The waterfall on the right is known as the Seven Sisters because there are seven streams of water.

Middle pictures copyright by Underwood & Underwood, N. Y.

That of Christian IV. is in a handsome chapel. It is but a short journey of three or four miles across the narrowest part of the Sound to the part of Sweden so long held by the Danes. Within view of the Swedish coast, a column on a hill is pointed out as the tomb of Hamlet. The story of this prince of Denmark was taken, as we know, by Shakespeare for one of his greatest plays.

### A FAMOUS SWEDISH CANAL CUT OUT OF GRANITE BY A SCOTTISH ENGINEER

If we cross from Helsingor to Helsingborg, we can pass on to the mouth of the Gota Canal at Gothenburg, on the Kattegat, the chief western port of Sweden, and steam by it and the great lakes of Wener, Wetter, and Maelar right across the south of Sweden to Stockholm and the Baltic beyond. The journey can be done in twelve hours by rail, but the trip of two or three days by steamer is most interesting and delightful. The great kings of Sweden, Gustavus Vasa, Charles IX. and Charles XII., all planned to build this canal, many of the locks of which are cut out of solid granite. It was a Scotsman, Thomas Telford, the great engineer, who helped so much in its completion.

This southern part of Sweden is the richest and most thickly peopled. In the clearings of the forests, crops such as rye, barley, oats, roots, and wheat are grown, and there is much dairy farming. North of the lakes of Wener and Maelar is the great iron-mining district. Swedish iron is particularly good for making steel; copper is abundant in the country, besides many other useful metals.

### STOCKHOLM, THE VENICE OF THE NORTH, A CITY BUILT ON ISLANDS

Stockholm, the capital of Sweden, is most beautifully situated on islands, connected by bridges, in the short river which forms the outlet of Lake Maelar. It is often called the Venice of the North. Perhaps the splendid quays, where ships are constantly loading and unloading, first attract a stranger's admiration, but it is equally delightful to watch the little steamers carrying passengers, as omnibuses do in ordinary towns, or to sit in the open squares watching the bright and picturesque figures as they pass. The museums are very fine, too; we can see the shirt Gustavus Adolphus wore at Lützen, and many other relics of the hero-kings. The massive palace is of great interest, also the church, with its iron spire 300 feet high, which has been the burial-place of the Swedish kings and heroes since the time of Gustavus Adolphus.

The Deer Park is the most beautiful of many parks in the neighbourhood, and the excursions all round Stockholm, on Lake Maelar and in other directions, are most charming. Dalecarlia, a district famous for its copper-mines, and its connection with the romantic story of Gustavus Vasa and his hairbreadth escapes, is also celebrated for the picturesque costumes of the peasants, whose snowy-white sleeves and black dresses, with stripes of bright colour on the skirts and aprons, look very gay when numbers are seen together, as on Sundays and holidays.

Upsala, to the north of Stockholm, is a famous university town, and great is the scene of excitement when degree day arrives. Hundreds of graduates, in their white caps, throng the streets.

### THE LAND WHERE THE SUN SHINES ALL THROUGH THE NIGHT

The singing of the students' songs is superb. It was Gustavus Adolphus who endowed this university with his private fortune; and there are many interesting links with the past, from the old pagan days onwards, in this city so dear to the Swedes. Education is very advanced in Sweden, which is famous all over the world for its fine system of gymnastics.

If we are in South Sweden between June 17 and 21, we shall have no real darkness at night, only twilight for about three hours.

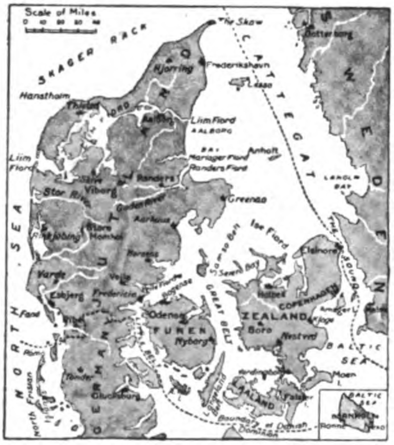
It is a fine trip of three days to steam to the north of the Gulf of Bothnia, from Stockholm, towards the land where the sun shines all night. If the wind is off the Swedish shore, forests of pine that bring such wealth to Sweden, and the meadows of endless farms, send their sweet fragrance out to sea. We shall see many fishing-boats along the shores and amongst the islands, and so many rivers glide into the sea, after their gentle journey from the snowy mountains, that the water becomes almost fresh, which is one reason why the Baltic is very ready to freeze in the winter—the ice is not all gone even in June. Sometimes saw-mills, farms, and villages come in sight, and the steamer stops at many piers for passengers and goods. The twilight becomes ever shorter as we go north, till at last, on reaching the Arctic Circle, the sun remains well above the horizon all night. It seems very strange to see butterflies flitting about, and to listen to the cuckoo, while gathering sweet violets and other wild flowers—all in sunshine at twelve o'clock at night!

It is a great time for the people who live in the land of the midnight sun when the sunshine comes to stay, and the ice breaks; they can open up communication with the south, and the rivers then bring down the trees that have been cut in the long winter twilight, when the sun never appears, and they depend on the brilliant stars and moon, and the wonderful northern lights.

There are many lines of railway, especially in the south and middle of Sweden, and they also cross, in places, by the valleys through the mountain chain to Norway; but if we wish to travel by land in remote parts, and within the Arctic Circle, we must go by the small two-wheeled carts for which farmers supply horses and drivers; or we can travel by boats on the rivers, for many of them are navigable. Round the head of the Gulf of Bothnia, and reaching to the Arctic Ocean, is the land of the Finns and Lapps, the descendants of the old people driven northwards by the Teutonic Scandinavians. The Finns are farmers; strange farming it seems to us when seed, sown at the end of May, grows and ripens so quickly under the constant sunshine that it can be gathered in seven or eight weeks, before the shades of early winter approach. The Lapps hunt and fish, and move about with their herds of reindeer. Some of the rich Lapps own 3,000 of these useful animals, that we know so well as the steeds of Santa Claus. People who travel in winter, in these regions, have to depend on them to draw a sleigh over the ice and snow, and stormy and terrible it can be in the heights and dreary plains, as the people journey on business to distant fairs and markets.

But we are on our way, in the height of the beautiful Arctic summer, to the North Cape, on the island of Mageroe, the most northern land in Norway and in Europe. Having crossed the strait, and climbed to the rocky plateau, nearly 2,000 feet high, we can stand at midnight looking north over the dark-blue Arctic sea, with nothing between us and the mysterious frigid region of the North Pole except an icy wall, that used to shut it in like an enchanted palace of old.

And behind us, fast asleep, lies all Europe—the northern peninsulas, the low countries, Germany, France, Austria, and the three southern peninsulas, with their blue and golden Mediterranean shores.



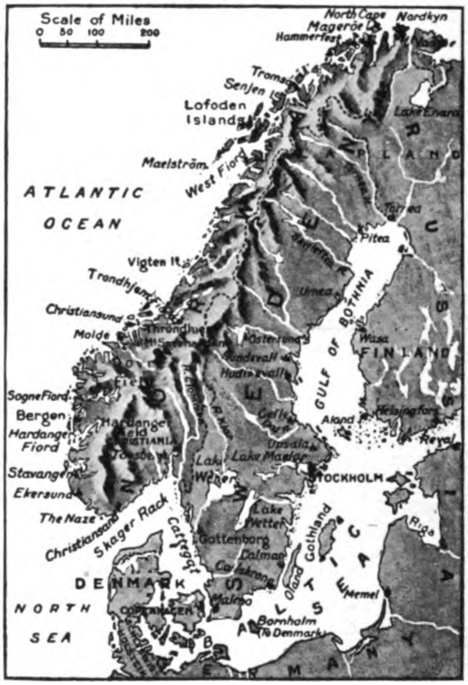
THE DANISH PENINSULA

From the North Cape we come by boat to Hammerfest, the most northerly town in the world, all built of timber, and with churches, and schools, and electric light, and telegraph. The curious fish-like smell is from the cod-liver oil made in great quantities, and all along this coast fishing fleets are busy for many months in the year. The sun does not set in Hammerfest from May 13 to July 29; and he does not rise from November 18 to January 23. In these regions cows and sheep have to learn to eat fish, so scarce is their usual food.

As we pass southwards, noticing the rocky Lofoden Islands, along the grand coast, carved out with the ice plough of glaciers from the mountains behind, and the water spade of the Atlantic and the rains it brings, the scenery becomes less bare and dreary. Even in winter, the ports are free from ice, owing to the warm west winds and the warm current of water that flows across the Atlantic from the Gulf of Mexico. Among the innumerable beautiful fiords of Norway's long coast, from which the men of the creeks put forth to sea, there are four that stand out for size and grandeur, and for historical interest. They are Trondhjem, Sogne, Stavanger, and Christiania fiords. Trondhjem Fiord is very beautiful with its rich vegetation, and its town of Trondhjem, formerly called Nidaros. It is called the cradle of the kingdom of Norway. For here the kings of Norway have been crowned since early days. Here the famous *Thing*, or meeting of the people, took place; here St. Olaf was buried, attracting hosts of pilgrims to his shrine. The cathedral of Trondhjem is the grandest of all the churches of Scandinavia.

As we see on page 3594, it was on the coasts between Nidaros, now Trondhjem, and Bergen that the great civil wars raged in the time of Sverre. The Sogne Fiord, a little north of Bergen, is the longest of the Norwegian fiords, over a hundred miles, and bare rocks are succeeded by narrow banks of smiling fields and orchards, and these again by sheer heights over 5,000 feet, over which the rivers pour from above. The largest glacier in Europe is found at the head of the Sogne Fiord.

Bergen—the pasture among the mountains—besides being of great interest from association with the old kings who lived and fought in it, and from its connection with the Hanseatic League, is the greatest fish market in Norway. It is a grand sight when the first of the northern seafarers arrive with their early boatloads of fish and cod-liver oil.



NORWAY, SWEDEN, AND DENMARK

Yet another great fiord is Stavanger, with scenery as grand as that on Hardanger. The town of Stavanger is very old, and has a fine cathedral, dedicated to St. Swithin, Bishop of Winchester. By the quays here, we see steamers from Newcastle, Hull, Rotterdam, and Hamburg, besides the numerous boats that ply all along the coast, in and out of the fiords. For there are but few railway lines or good roads in these parts of Norway. The people go to church, to market, to school, all in boats.

Christiania, the capital of Norway, lies at the head of the beautiful fiord of the same name near the borders of Sweden, founded, as we see on page 3595, by Christian IV., near the site of the old town of Oslo, where his sister Anne married the Scotsman, afterwards James I. of England. The trade of Christiania gives an idea of the resources and work of the country. From its docks and quays are despatched timber and ice, packing paper and paving stones, besides herrings and beer. Engine works, nail factories, shipbuilding, cotton mills, are all busy and noisy round about the capital. Among the many interesting things to see in Christiania, illustrating the history of Norway and the life of its people, are the two Vikings' ships, in which the old chiefs had been laid to rest with their arms and treasures, just as the old Germanic kings were buried in their war chariots. With the actual timbers and the mast where the square sail was raised by a pulley, and the open spaces for the oars, all before us, it is easy to add in imagination the shining dragon's or bird's head on the prow, and the stalwart men with their flowing hair, and shining spears and shields, as they swept out of the beautiful fiords.

And the mothers and wives who watched them go? Stones are still found standing on the breezy shores raised by them, with inscriptions to the son or husband who "bravely sailed away, but returned not."

The next story of Countries is on page 3623.

## THE NOVELS OF THACKERAY

**WE have read "The History of Arthur Pendennis," in which Thackeray gives us a picture of a young man's experiences before he settles down as the husband of a charming wife and father of a young family. Pendennis, it will be remembered, is supposed to become an author in the story. Thackeray, some five years later, in 1853, began another long novel in monthly parts, and, although his own name appears on it, he pretends on the title-page that it is "edited by Arthur Pendennis, Esq." Its full title is "The Newcomes: Memoirs of a Most Respectable Family." By pretending that Arthur Pendennis tells the story, the two novels are thus connected together in interest. Colonel Thomas Newcome is one of the most beautiful characters in fiction.**

# THE NEWCOMES

CONTINUED FROM 3481

THERE are some natures that seem to grow a little sour with the passing of the years, or, at least, tend to dryness and stiffness, like an old tree; while there are others that sweeten, the older they grow. Lieutenant-Colonel Thomas Newcome, C.B., of the Bengal Cavalry, was of the latter and better sort. Though at all times of his life he proved himself a true gentleman, the beauty of his character was seen at its best towards the end of his days. The generous heart of youth was ever his; he was as brave as he was tender and unselfish.

In those days of the late Georgian period, when a journey to India was a very different matter from what it is to-day, the officers who served in the Indian Army could not come home on furlough every few years. Colonel Newcome, indeed, had left England as a youth, and only found himself back in the Old Country after thirty-four years of continuous service. But the burning suns of India, though they had bronzed his face, had dried up nothing of the frankness and simplicity which had marked him as a young man.

The great delight of his life, in returning to England after his long period of absence, was to rejoin his beloved son, Clive, whom, on the death of his mother, the colonel had sent to England to be educated.

Colonel Newcome was immensely impressed with all the clever friends his boy had made in London, and he made a point of visiting personally everyone who had done a kindness to the lad, in order to express, in his courtly old way, his sincere thanks. Nay, he even searched out every child of his Indian friends that, like Clive, was in England for education. Ascertaining that his old nurse, who had been some relative of his family, was still alive, he went many miles to visit her, just for old times' sake. Everywhere he went he seemed to shed some feeling of goodwill and kindness; and if there were any who did not love the colonel, it was because they themselves were unworthy of love.

His two stepbrothers, Hobson Newcome and Sir Brian Newcome, were members of this miserable minority. The colonel's own mother had died when he was but a child, and his stepmother had behaved so harshly to him that it was largely on account of her unfriendly treatment he first left home. She had died during his long stay in India, and although she had left him nothing in her will—everything going to her own sons—he was glad to know she had spoken kindly of him, after he went away.

His two stepbrothers had come into the banking business of his father, and as these persons cut a very pretentious figure in the social world of their day, they had found it desirable to discover some fictitious ancestors who dated back before the Norman Conquest; their chief anxiety was to forget that their father had once been a poor weaver, and that it had even been whispered he had also been a foundling. The colonel was in no way ashamed of his humble origin, and we may be sure his visit to his old nurse was not approved by his snobbish stepbrothers. The greatest time of the colonel's life had certainly begun with his return to England, and his meeting and reunion with his dear boy. From the day Clive had been taken away from him in India, he had lived in dreams and plans of what he would do when he came home to spend his furlough with his son.

### COLONEL NEWCOME PLANS A "GRAND TOUR" FOR HIS SON CLIVE

These were the days when every young gentleman's education was supposed to be complete only when he made "the grand tour" through Europe. So, out there in India, the colonel had read up all sorts of books of travel, and had spent many an hour studying maps, planning out the tour he would take his Clive some day. And, of course, he saved his money, so that Clive should want for nothing; yet he never let his personal economies interfere with his generosity to others. Though his own clothes grew shabby, there was not a man who knew him but respected his well-worn uniform, knowing full well that his nature was free from the tiniest taint of meanness.

Clive's natural gifts seemed to lie in the direction of draughtsmanship. At the Greyfriars School he was continually making comic sketches of the masters and the scholars, and these he sent out to his admiring father in India, who showed them all round the regiment with the most innocent pride.

"The boy's talent for drawing is wonderful, sir, wonderful!" he would say to his brother-officers. "He sent me a picture of our old school, the very actual thing, sir—the cloisters, the school, the head gown-boy going in with the rods, and the doctor himself. It would make you die of laughing!"

The colonel would also regale the ladies of the regiment by reading Clive's letters aloud to them, as well as letters from a lady friend in praise of the wonderful boy. He even bored some of his hearers with this prattle; and sporting young men would make bets that the colonel would mention Clive's name once before five minutes, three times in ten minutes, twenty-five times in the course of dinner, and so on. But they who laughed at the colonel laughed very kindly; and everybody who knew him loved him—everybody, that is, who loved modesty and generosity, and honour.

### THE MEETING OF FATHER AND SON AND THE HAPPINESS OF BOTH

At last, the happy time had come for which the kind father had been longing more passionately than any prisoner for liberty, or schoolboy for holiday. Once more he was treading the muddy pavement of Smithfield on his way to Greyfriars, a path he had trodden many a time in his own early days. As he arrived at the school it was the play-hour, and all was noise and bustle. But Clive, dressed in his very best, saw his father at once and hastened to him. Schoolboys, grinning through the bars, envied him as he walked away; senior boys made remarks on Colonel Newcome's loose clothes and long whiskers, his brown hands and unbrushed hat. But the gigantic Smith, the cock of the school, who happened to be looking majestically out of a window, was pleased to say that he thought Newcome's governor was a fine, manly-looking fellow.

THE COLONEL READING CLIVE'S LETTERS

Colonel Newcome used to bore his friends in India by reading aloud Clive's letters, and always talking about his boy. But they all liked him none the less.

The colonel himself used almost the same words about his own son when he sat down that night to smoke a cigar with his old friend, James Binnie, the quiet but able Scotsman, who had come back with him after twenty years of service as a magistrate in India.

"Isn't he a fine fellow, James?" said the colonel, his face alight with joy.

"Have ye been breathing a prayer over your rosy infant's slumbers, Tom?" replied Mr. Binnie, in the Scottish way of answering one question by asking another.

"And if I have, James Binnie," the colonel said gravely—"if I have, I hope I've done no harm. The last time I saw him asleep was nine years ago, a sickly little pale-faced boy in his cot; and now, sir, that I see him again, strong and handsome and all that a fond father can wish to see a boy, I should be an ungrateful villain, James, if I didn't—if I didn't do what you said just now, and thank God for restoring him to me."

Binnie did not laugh any more.

"By George, Tom Newcome," said he, "if all men were like you, there'd be an end to both our trades—there would be no fighting and no soldiering, no rogues and no magistrates to catch them."

The colonel had good reason for his pride in his son, as Clive had proved himself worthy of his father. In all Greyfriars School there was not a manlier young fellow than Clive Newcome.

CLIVE STUDIES ART AT GANDISH'S

**As Clive had shown some taste for art, and wished above all to be an artist, his father sent him to a famous school conducted by a teacher named Gandish.**

### A PLEASANT PICTURE OF CLIVE NEWCOME AS A YOUNG MAN

Healthy and handsome, with his wavy light hair and laughing mouth, and those blue eyes so full of intelligence and good humour, he was a universal favourite with his fellow-scholars. Above all, he had inherited from his father that frankness and modesty which prevented him from overrating himself; so that, despite the admiration of which he was the object, he was in no way a spoiled youth and was free from all affectations.

Not the least of the tributes to the character of Clive was the fact that, even in the homes of his two uncles, he was a welcome guest. The families of these persons were little given to friendship for friendship's sake. Their intimates and visitors were chosen chiefly in the hope of deriving some personal advantage from their acquaintance. Yet Clive had managed to reach even their selfish hearts, and was always welcomed in their homes, until, one day, it dawned upon Sir Brian that his nephew was a boy no more, and would soon be a man with man's ambitions.

The thought brought uneasiness to the banker and his wife, Lady Ann, for they had a daughter, Ethel, who might be in danger of falling in love with Clive if he, on his part, betrayed an equal tenderness towards her. This was the disturbing thought of Sir Brian and Lady Ann, for their anxiety had been to bring up Ethel with the idea of a rich and distinguished marriage as the chief end of her existence.

Then there was old Lady Kew, the mother of Lady Ann, to be reckoned with. She was a person accustomed to have her own way, thanks to her domineering manner, backed up by an ample fortune. Ethel was her granddaughter. Lady Kew was expected to leave her wealth to Ethel on condition that she married the young Lord Kew, her cousin; and Sir Brian and Lady Ann, who would have agreed to anything Lady Kew wished, had good reason for supporting the imperious old lady in her plans for Ethel's future, as, apart from the fortune, they would dearly have liked a lord for son-in-law.

### THE EFFECT OF THE COLONEL'S HOME-COMING ON SOME OF HIS RELATIVES

It will thus be seen that, from his own point of view, Sir Brian Newcome was not unjustified in any efforts he made to prevent the friendship between the cousins from deepening into love. In due time we shall see how he succeeded. We can easily imagine how the coming of Colonel Newcome, with all his fresh and manly frankness, caused some disturbance in the family circles of his snobbish stepbrothers. His arrival in their midst was like a breath of fresh air driving through a hot and stuffy room. His disregard for all their shoddy nobility, his failure to be impressed either by wealth or title, displeased the elder Newcomes sadly; but the fresh air of his character had an unexpected effect on one of the family.

### HOW THE OLD COLONEL WON THE HEART OF HIS LITTLE NIECE, ETHEL

Although Ethel's training had been of a kind to make her haughty and contemptuous to those whom she had been taught to consider beneath her in worldly position, her better nature had prevented her from being entirely spoiled. When she met her uncle, the colonel, for the first time, his breezy nature quite won her girlish heart, and he was equally delighted with his lovely little niece. He took her little slim hand, and laid it on his brown palm, where it looked all the whiter; he cleared the grizzled moustache from his mouth, and stooping down he kissed the little white hand with a great deal of grace and dignity. There was no point of resemblance, and yet there was something in the girl's look, voice, and movements which caused his heart to thrill, and an image out of the past to rise up and salute him. The eyes which had brightened his youth, and which he saw in his dreams and thoughts for many years afterwards, as though they looked at him out of heaven, seemed to shine upon him after five-and-thirty years. He remembered such a fair bending neck and clustering hair, such a light foot and airy figure, such a slim hand lying in his own, and now parted from it with a gap of ten thousand long days between.

### THE COLONEL HAS A NEW PLAN FOR THE HAPPINESS OF CLIVE

In short, the good colonel was so charmed with Ethel that his thoughts at once flew in the very direction Sir Brian would have dreaded—he was presently dreaming of the happiness that might be his, if he but saw his dear boy Clive wedded to this charming little lady. Thoughts of his boy were uppermost in his mind that night when he said to his servant: "I say, Kean, is that blue coat of mine very old?"

"Uncommon white about the seams, colonel," said the man.

"Is it older than other people's coats?"

Kean was obliged gravely to confess that the colonel's coat was very queer.

"Get me another coat, then. See that I don't do anything or wear anything unusual. I have been so long out of Europe that I don't know the customs here, and am not above learning."

And Kean retired for the night, vowing that his master was an old trump, as indeed he was. For his new concern about his clothes sprang from his desire to be a credit to Clive, by appearing smart and well dressed among his friends.

Whatever the plans of the worthy colonel may have been to further the idea of a marriage between his son and Ethel, Clive himself now took a step which would probably have upset his father's best-laid plans, though the colonel loved him too well ever to find fault with what he had done. Clive decided to become an artist.

### CLIVE NEWCOME DECIDES TO BECOME AN ARTIST AND BEGINS HIS STUDIES

Now, to earn one's living by drawing pictures or by writing books used to be considered a very doubtful occupation, and not befitting a gentleman. Certainly, there was no hope that the purse-proud parents of Ethel, far less old Lady Kew, would dream for one moment of having an artist marry the heiress.

But, whatever Colonel Newcome may have thought about his son's choice of profession, he did all he could to advance Clive's artistic education. In addition to arranging for him to become a student under a well-known master of the time, named Gandish—whose knowledge of art had been acquired at the expense of other education, as he was in the habit of describing painting as "'igh hart"—the colonel had a studio fitted up for Clive at the house which he and James Binnie had rented during their proposed sojourn in London.

Of course, Clive was speedily a favourite in the somewhat mixed society that centred around Gandish's, and all sorts of brilliant things were prophesied of his future. The fact that he was daily to be seen riding a fine horse among the fashionable people of the West End may also have had something to do with these prophecies of his future greatness, as his father's generosity to him was really greater than his means justified, and gave the impression that Clive was heir to riches.

As the months rolled on, and the worthy colonel watched over his son and rejoiced in his companionship, his delight in the reunion with Clive was weakened just a little when he began to realise that, on his military income, he could not give his son all the advantages he had hoped. He therefore made up his mind to return again to India at the end of his furlough, in order to put in the further service for promotion which would carry with it a sufficient pension for his old age. Before returning to India, however, he made ample provision for Clive, and that young man determined to pursue his profession with such ardour that he might soon be independent, and not need to take money from his father.

### CLIVE GOES ABROAD AND HAS A FATEFUL MEETING WITH ETHEL

His first tremendous success was to sell four sketches to an art-dealer, who gave him thirty shillings for the lot; and Clive at once sent the great news to India, pointing out that as he could easily do six such sketches any morning, this meant at the very least five hundred pounds a year to him. He had great hopes that he might not need to touch his allowance at all! But, of course, these great hopes all came to nothing, as there is a difference between drawing sketches for one morning at the rate of five hundred pounds a year, and drawing sketches every morning all the year at the same rate. Clive, however, celebrated his first thirty shillings by inviting his friends to a feast which cost a great deal more than his four sketches had earned, and afterwards he set out for a sketching tour through Europe, very well equipped, with a travelling carriage and all sorts of comforts bought, not by his earnings, but out of his allowance.

As fate would have it, in the course of his travels, he fell in with his aunt, Lady Ann, who was travelling abroad with Ethel and her other children.

This was in many ways a fateful meeting for Clive and Ethel. Free for a little from the restraints of her artificial life in London, Clive's beautiful cousin, in the days which they enjoyed together, discovered that she really loved Clive, and was sincerely loved by him. But there was nothing but unhappiness in this knowledge of their affection, for Ethel knew what was expected of her by her parents. And Clive, knowing that he was looked upon with disapproval by them, could only follow the honourable course of going away from the one he loved.

### THE NEWS FROM LORD KEW THAT SENT CLIVE HOME FROM ITALY

It was to Rome that he went at last, and there, amid the ruined grandeur of the famous city, and the picturesque country around it, he spent many happy days in filling his sketch-book with pictures of Italian scenes and people. Life seemed to be flowing on very pleasantly for him, and, under the sunny skies of Italy, he had almost become reconciled to the fate that kept Ethel from him. But one day, when at Naples, whom should he meet but the young Lord Kew, with whom, despite his engagement to Ethel, Clive had never ceased to be on friendly terms.

By another day the impetuous young man was in a ship cleaving swiftly through the azure waters, but not swift enough for Clive, homeward bound for England. The cause of this sudden good-bye to Italy was the news that the engagement between Lord Kew and Ethel had been broken off. Clive now felt himself free to pay court to Ethel again, but he reckoned without old Lady Kew, who set herself to defeat his plans, as she had chosen another nobleman much wealthier, far prouder than Lord Kew, and uncommonly stupid withal, as the new suitor of Miss Ethel. This was the Marquis of Farintosh, whose only attraction, apart from his wealth, was some measure of good looks.

### THE COLONEL COMES HOME AGAIN WITH CHANGED FORTUNE AND A GREAT IDEA

Clive was thus again in despair, when his father came back from India to settle down in the Old Country. The fortunes of the dear old colonel had undergone a change for the better, as it appeared that he had invested all his money in a great Indian financial concern known as the Bundlecund Banking Company, of which he had become a director, although he was entirely innocent of business affairs.

He received so much interest out of this concern that he now esteemed himself quite a rich man, and the first thing he did in England was to go to Sir Barnes Newcome, his nephew, who, at the death of his father, Sir Brian, had become head of the Newcome Bank. Sir Barnes was just the same mean-spirited man that his father had been, but he listened to what the colonel had to say, out of respect for the Bundlecund Banking Company. And what the colonel had to say was soon told.

### ONE MORE DISAPPOINTMENT FOR COLONEL NEWCOME AND CLIVE

"I have a pension of a thousand pounds a year," he said, "besides all the money I have made out of the banking company, and two hundred a year is all that I want for myself. I will give Clive every shilling of the rest to-morrow, if he marries as I wish him to. My boy will thus have an income of three or four thousand pounds a year, Barnes," cried the colonel, with his face shining. "I want your sister—I want my dear Ethel for him!"

But all the colonel had to offer seemed a poor substitute to Barnes for Lord Farintosh's fifteen thousand a year, though he pretended, for the sake of business relations with the Bundlecund Company, to look with favour on the colonel's proposal. Soon afterwards, however, when Lady Kew had hurried Ethel off to Scotland, where her engagement to Farintosh was publicly announced, the colonel found he had been deceived, and, hastening at once to the Newcome Bank, he gave Sir Barnes a bit of his mind in the presence of his clerks, denouncing him as a liar and a traitor.

The cowardly Barnes was urged by his friends to challenge the colonel to a duel, but excused himself from fighting with his uncle, and, when Clive challenged him, he showed the white feather again.

### ANOTHER TOUR ABROAD AND WHAT HAPPENED BEFORE IT ENDED

Once more in their unequal fight against their scheming relatives, whose sole wish was not at all for Ethel's happiness, but to see her married to a wealthy nobleman, the colonel and his son sought to console themselves by a long tour on the continent. Towards the end of the tour they found themselves in the city of Brussels in the late autumn, and there settled down for the winter with the colonel's old friend, James Binnie, who was living abroad with his widowed sister, Mrs. Mackenzie, and her beautiful young daughter, Rosa.

While their tour abroad had in some sense brought them calm of mind and resignation of heart, it was also to prove a crowning misfortune. For a letter, which would have brought them back to England as fast as post-chaise and vessel could carry them, had followed them from place to place until it was lost to them for ever. This letter told how, disgusted at last by the fortune-hunting and title-seeking schemes of Lady Kew and Sir Barnes, in which no thought was given for her real feeling, Ethel had revolted and refused absolutely to be married to Lord Farintosh. Not only so, but Lady Kew herself had died suddenly, and Ethel was now the heiress of her fortune, and free to marry as her heart would guide her.

Alas for Clive, when at the end of the winter he returned to London with his father—he was no longer free! He was accompanied by his young wife, Rosa, the daughter of Mrs. Mackenzie.

### COLONEL NEWCOME'S NEW LIFE IN LONDON AS A MAN OF WEALTH

A great change now took place in the life of the colonel. The Bundlecund Banking Company was supposed to be flourishing immensely, and Colonel Newcome, as one of its leading directors, was expected to maintain a great style in London, to impress the world with the importance of his company. He, who had been content with the humblest of houses and the plainest fare, now opened a magnificent mansion in the West End, where Clive and Rosa lived with him in splendour, and all the fashionable world came to admire the state of the rich Indian bank director.

But, all too soon, he found that, amid this display of wealth and its luxuries, unhappiness crept in. Clive could not be resigned to the loss of his first love by his hasty marriage, for Rosa did not fill the place that Ethel might have occupied. The colonel had strange forebodings of disaster which nothing seemed to clear away; not even the great day when he was elected member of Parliament for Newcome against his unworthy nephew, Sir Barnes, who had opposed him. The disaster came at last when it was discovered that the Bundlecund Banking Company was nothing but a gigantic swindle. At three-score years and ten, with never a speck upon his fair reputation, and from no fault of his, the poor old colonel found himself penniless, his fine London house in the hands of the brokers, all his treasures sold off, and even his pension subject to arrest.

In his innocent belief in the banking company, where all his fortune had been staked, he had induced many of his friends to put their money there, and, now that the crash had come, there were those who accused him of a dishonesty utterly foreign to his nature. The worst of these reproachful friends was Rosa's mother, who now made his life and Clive's unendurable, and, one day, the good old man quietly went away from the humble lodgings he was sharing with his son and Rosa, and did not return to them again.

COLONEL NEWCOME AND HIS NEPHEW

The colonel had wished his son to marry Ethel, sister of his nephew, Sir Barnes, but Barnes tried to prevent that, and, when the colonel found how his nephew had acted, he went to his bank and gave him "a bit of his mind" before the trembling clerks.

## HOW THE LAST DAYS OF A GALLANT OLD SOLDIER WERE SPENT

A few days later, those who attended the solemn ceremony which took place each year at the old Greyfriars School in memory of its founder, who had also founded the almshouse close by as a retreat for gentlemen in distress, saw among the poor pensioners, who had to attend the ceremonies in their black gowns, one whose dear old head was bent in sorrow over his Prayer-book, though the bright decoration of the Order of the Bath shone on his breast. This was Colonel Thomas Newcome, whom a bitter fate had brought in his old age to the old almshouse beside the school where the happy days of his boyhood had been spent.

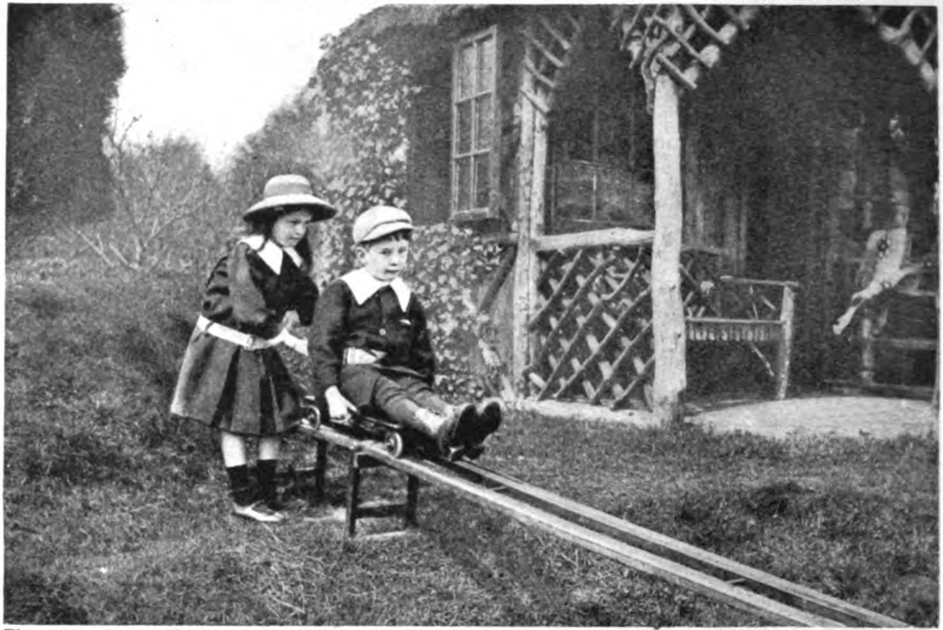
Life was now quickly deepening into the shadows for him, yet one who was young and blooming was to be cut off even before the old man had died. Almost from the death-bed of the hapless Rosa, Clive was summoned to that of his father. Lest it might pain the dying man, Clive went to see him with no sign of mourning, and there, to his surprise, he found Ethel with him. As Clive entered, his cousin rose and gave him her hand, the hand which was one day to be united with his in peace and happiness for the rest of their lives, though he who had so long dreamed of that was lying stricken with his last illness. Another lady came there, beautiful even in her age, with all that indescribable nobility of presence which marks the "great lady." It was for her hand that the dying colonel reached out with his last effort, saying with a heart-rending voice, "Léonore, Léonore!" as the lady sank upon her knees beside the bed. This was the end of the colonel's old romance, for the Countess de Florac, who was none other than the beautiful lady now there by his death-bed, had been taken away from him in his youth just as Ethel had been taken away from his son. But fate had been less kind to Thomas Newcome and his sweetheart Léonore than it now promised to be to Clive and Ethel.

## HOW COLONEL NEWCOME ANSWERED THE LAST ROLL-CALL

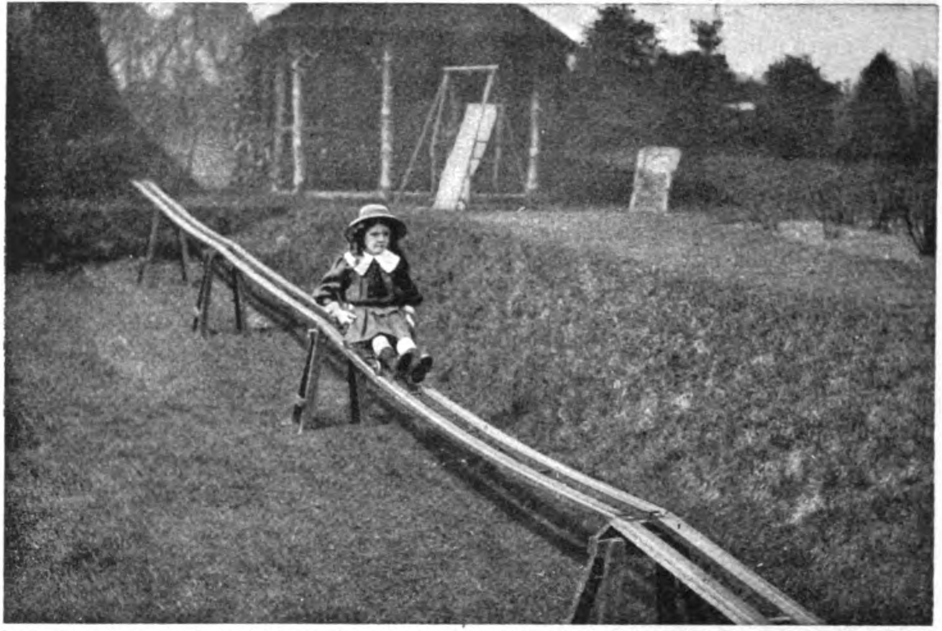
At the usual evening hour the chapel bell began to toll, and Thomas Newcome's hands, outside the bed, feebly beat time. And just as the last bell struck, a peculiar sweet smile shone over his face, and he lifted up his head a little, and quickly said: "Adsum!" It was the word the boys used at school when names were called; and, lo! he, whose heart was as that of a little child, had answered to his name, and he stood in the presence of the Master.

The next Famous Books are on page 3661.

# A TOY RAILWAY FOR A GARDEN



These two pictures show a simple garden switchback, which, if properly constructed and properly used, is quite safe, and affords plenty of exciting and healthy amusement. But it must be properly and strongly made, and it would be risky to make it yourself unless you are an expert carpenter. A carpenter, or an engineer, is the proper person to do the work, and any carpenter, after being shown these pictures, would know how to do it. The supports must be strong, the planks and the rails must be securely fastened together, and both sides should be on the same level. If the wheels of the carriage have rubber tires, the working will be almost noiseless and much more pleasant than otherwise; but that is not necessary. The switchback will work quite well with metal wheels.



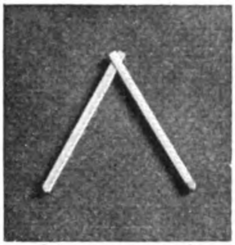
In the first picture the little girl is starting the boy, and in this picture the little girl is riding down the switchback. If the lawn or garden is on a slope, the starting-point should be at the top of the slope, and the finishing-point at the bottom. But the effect of a slope can be got on level ground by having the trestles or supports of different heights, the highest being at the starting-end. Even if the switchback is level, it can be made to work by the passenger inclining the body as if on a swing. The weight thus thrown forward sends the carriage along.

# FUN IN A BOX OF MATCHES

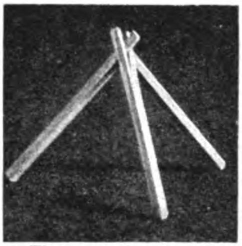
CONTINUED FROM 3518

A box of Swedish safety matches costs one or two cents. A good deal of amusement can be got out of this little box and still leave the matches perfect for their original purpose. The pictures that we see in this article can teach us some feats with matches.

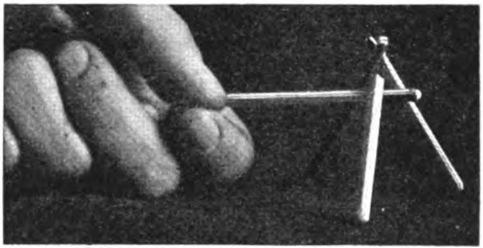
The first feat that we may try to perform is to lift three matches with one match. It sounds hard, but the pictures show that it is really simple. We first slit the end of one match a little way and trim the end of the second to a wedge-shaped point. We insert the wedge-shaped point into the slit, when the two will be the shape of an inverted V, as seen in picture 1. Now we place a third match as seen in picture 2, so that the whole three remain standing like the corners of a hollow pyramid. By inserting a fourth match as seen in picture 3, and then by gently moving the first two matches so that the third match falls on to the lifting match in the manner shown, the whole can be lifted with a steady hand.



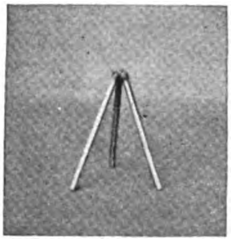
1. Joining two matches



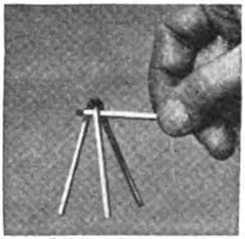
2. Three matches standing



3. Lifting three matches with one match



4. Tower of three matches



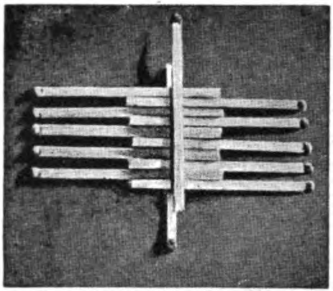
5. Lifting the matches

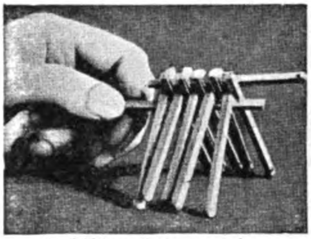
A similar trick can be performed rather more easily if the ordinary red-headed lucifer matches are used. In this case three matches are propped up with their heads upward, as seen in picture 4. Then a fourth match is lighted and the flame is made to touch the heads of the other matches, when they will take fire. The flame should be put out by blowing straight down upon the matches. Then, by using the fourth match in the manner shown in picture 5, all may be lifted. The burning of the three match-heads in close proximity has caused the heads to run together a little during combustion, and the ash of the three has sufficient cohesion to enable the feat to be carefully performed.

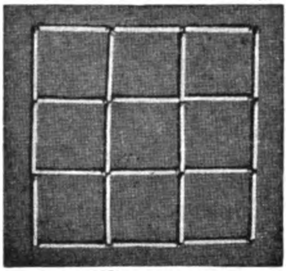
Now we may set ourselves the task of lifting several matches with one match. The number lifted may vary, but picture 7 shows eleven matches lifted by means of one match. This trick is performed more easily with square-shaped matches than it is with round matches, although with round matches it may be done also. The two rows of matches, as seen in picture 6, should be placed with heads outward and close together on top of the bottom match. The top match should be placed so as to leave room for the finger and thumb to grasp the bottom match without disturbing the arrangement. Then, by lifting as in picture 7, the feat may be accomplished.

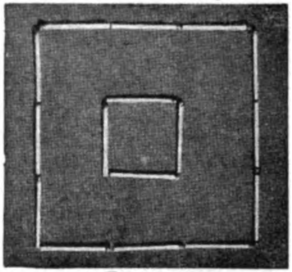
Picture 8 shows twenty-four matches arranged so as to form nine squares, and the problem is to take away eight matches and leave two squares. The way to do this is shown in picture 9.

The next thing that we shall do is neither a puzzle nor a feat, but it is interesting. We take a matchbox and three matches, which we arrange like picture 10, with a match stuck head outwards into each side of the box and another match held between the two heads. The "spring" given to the two matches by pulling them apart so as to admit the third, will hold the third one securely. Then we tell our friends that we propose to apply a light to the middle of the third match, and invite them to say which of the other two will first take fire from the flame. In every case the opinion will be the match next to the head of the cross match. But this is found not to be so. The third match as it burns in the middle gets weaker, and soon the pressure of the other two matches upon its ends bends it and then makes it jump into the air quite a little way.

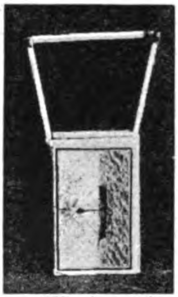

6. Arrangement before lifting


7. Lifting eleven matches

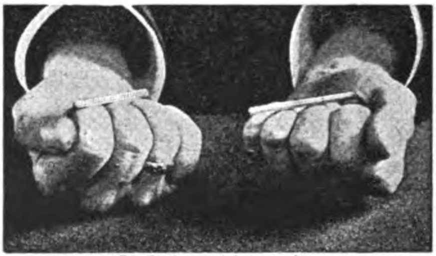

8. Nine squares


9. Two squares

Now, there is a genuine trick that is a little mystifying if adeptly performed. We take a match in each hand, the hands resting palms upwards on the table. Then we close the hands and ask someone to place a match upon the closed fists, as seen in picture 11. We now say that we are able to pass the match from one hand into the other without opening the hands. We make a rapid up-and-down movement of both hands. This causes the two visible matches to fall on the table, and we ask our friend to replace them on top of the knuckles. He does so, and we make another rapid movement so as to cause the two exposed matches to fall into the hands. Then we open the hands, one of which is found to contain three matches and the other to contain only one, as seen in picture 12. The secret of the trick is that when we let the two matches fall upon the table, they were not the two from the top of the knuckles of each hand, but one from the knuckles and one from the palm of the same hand. The movement we made caused one knuckle match to fall into the palm of the hand, so that, unseen by the spectators, when the two matches were seemingly replaced, one palm held two matches and the other was quite empty.

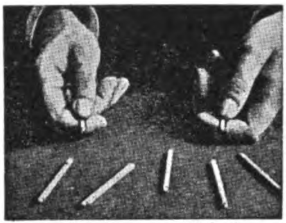

10. Which match will burn first?

The next trick to which we shall give attention is called the tramps and ducks. We take seven matches, two of which we retain—one being left in each hand—and the other five we place on the table in front of us, as seen in picture 13. Then we tell the little tale of the tramps and the ducks. "There were two tramps—the matches in the hands—who saw five ducks—the matches on the table—and resolved to steal them. So they took one alternately." Here we pick up the first of the five matches with one hand, the second with the other hand, and so on, alternately, until there are none left on the table. We resume the tale. "But before they had run away they saw the farmer coming, and so they put down the ducks again." Here we replace the matches on the table, one from each hand, alternately, until all five have been put down. "The tramps hid in a hedge until the farmer had gone, and then they took them up as before." Suiting the action to the words, we again pick up the matches one after another with alternate hands. Then, keeping the hands closed, we go on again. "But the tramps began to quarrel, and one

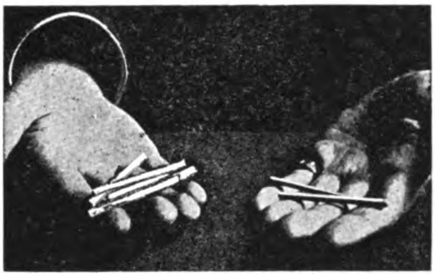

11. Conjuring with matches

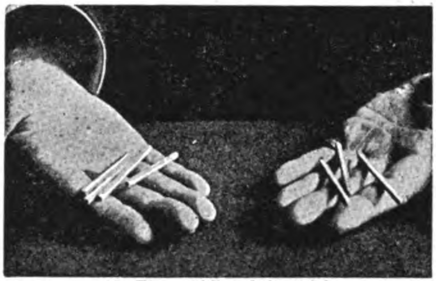
12. How is it done?

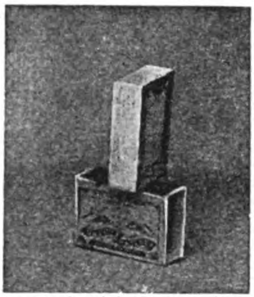
said to the other: 'You have got four ducks and I have only one.' And so he had." Here we open the hands, one of which has two matches in it and one has five, as seen in picture 14. The audience is naturally very much perplexed at the result.


13. The tramps and ducks

The secret of the trick is this. After we had picked up the five matches the first time, there were three matches in one hand and four in the other, as seen in picture 15. When we replaced the matches on the table we began with the hand having three matches, so that when the five matches were on the table again one hand had two matches and the other none. Of course, we did not let this fact be noticed. Then, when we picked up the matches finally, we began with the hand that already held two matches, with the result that, as we have seen, we finished with two matches in one hand and five in the other, as shown in picture 14. Picture 16 shows the last trick, which is performed not with matches, but with the matchbox. We place the two pieces of the matchbox in the position shown, intimate that it is our intention to bring our closed fist down with all our force upon the topmost point, and invite opinions as to which piece will be broken by the blow. We shall have some of our friends say that the upper part, being not so strong as the other, will break, while others will assert that the lower part, being underneath, will receive the full force of the stroke, and therefore break. But when we strike, no matter how hard, we shall find that the two pieces bound away unbroken. The result is so unlooked for and so unexpected that it generally causes much astonishment among the audience. This is only a little of the fun to be obtained from a box of matches. Other problems to be performed with matches are given on page 1723, and the answers to them appear on page 1824.


14. The end of the trick


15. The middle of the trick


16. A trial of strength

# THE BOY'S HOME MUSEUM

Most boys collect things—stamps, birds' eggs, fossils, coins, butterflies and moths, insects, shells or botanical specimens. The pride of possession is a good thing in its place, but no boy should collect things merely to be able to say that he has them. He should learn as much about the things he collects as he can. If his hobby be the collection of birds' eggs, he should learn not only the names of the birds whose eggs he has, but he should also be able to identify the birds, to know something about their habits, and to recognise their nests. So with insects, shells, or any other things collected. The objects and their associations should be studied.

But orderliness should always be a characteristic of the boy who pursues the hobby of making collections. Therefore, every boy collector should possess a little museum to hold his collection. A museum is easily made, and every boy who is worth his salt can make one for himself.

A very neat and convenient little museum can be made from a wooden box, which we can probably secure from the groceryman. Line the inside walls with green cartridge wall paper. Then get five or six pieces of board the size of the inside of the box, and nail in a couple of shelves. These shelves are to hold the trays for our collections. The trays can be either the ordinary lacquer trays you can buy in shops, or little wooden trays made out of strips of strong thin wood nailed strongly together. The trays are most necessary, as we will want to draw our collections out without disturbing any of them. In cases where the collection is of some frail or perishable things, such as butterflies and moths, it would be well to cover the tray with a strip of glass cut to fit over it tightly.

Now, this museum is not at all difficult, and every boy could, if he liked, easily make one something like it. Why should he not try? In his museum he can have one tray for fossils or rocks, another for odd coins, and so on.

# SOME GAMES FOR OUT OF DOORS

## GARDEN QUOITS

Garden quoits should be played with wooden rings, or wire ones bound with some soft material. A peg is driven into the ground, and the players stand at a distance, each having a number of rings. They then throw in turn, and those who get the greatest number of rings over the peg win the game, and any prizes that may have been offered.

## CUDGEL

Two small holes, ten feet apart, are scooped in the ground, and round each a circle about a foot wide is drawn. At these holes two batsmen stand, each armed with a short stick, one end of which is held in the hole. From a short distance away, two bowlers pitch, in turn, a small piece of wood, called a cat, towards the holes. If it drops into one of the holes both batsmen are out, but if it is struck by one of them they change places as quickly as possible while the bowlers try to drop the cat in a hole before either of the batsmen can protect it by popping in his stick. If the cat is pitched by a bowler so as to fall inside the circle surrounding a hole, he picks it up and runs to a little distance with his partner.

They then decide between themselves, without the batsmen knowing, which shall hold the cat, and then return to ask the batsmen to guess who holds the cat. As the question is asked they both kneel down, one opposite each hole, and the batsmen answer by simply standing together opposite the bowler they choose. If the guess is correct the game must go on as before; if wrong, the boy holding the cat at once pops it into the hole by which he is kneeling, and the batsmen become bowlers.

## HOP, SKIP, AND A JUMP

Scratch a line on the ground, and stand so that the toes just touch it. Then, lifting one foot, hop as far as possible. Follow this with a skip, and then, with both feet together, give a long jump, remaining quite still at the end of it till someone has drawn a line where the heels struck the ground. Each player in turn does his best, and the one who covers the greatest distance with his hop, skip, and a jump is the winner.

## OBSTACLE RACE

This is great fun and will show the different ways boys have of getting over difficulties. Instead of the race-course being kept quite open, obstacles are put up at different places for the runners to get over as best they can. Those who do so most quickly are likely to reach the winning-post first. For small boys these obstacles should not be too troublesome. The first might be a long hurdle for them to climb; the next, a row of bottomless canvas sacks side by side on the grass, one for each boy to crawl through, and perhaps beyond these a number of ordinary school slates pegged to the ground with pencils attached, upon which each runner must write—quite distinctly—a short sentence arranged beforehand, adding his number instead of his name at the bottom of the slate. Other kinds of obstacles, however, will very soon suggest themselves to those who manage the race.

## GUARD THE BLOCK

In the middle of a large circle an old tin or small block of wood is placed, and the "keeper" stands over it to guard it. The rest of the players try to kick it out of the circle, and when one succeeds they all run away and hide. The keeper then replaces the block, and sets off in search; but he dare not go far in case one of the enemy should run from hiding and steal his block again. The moment he spies anyone, he calls out his name and races back to the block to touch it before the boy he has found can get there. If he succeeds in doing this the other becomes his helper, and the first keeper may more safely go on with his search; but he should not go too far, lest several of the hiders come out and attack his new partner. In that case he would have to begin all over again. Every time anyone is found the keeper must touch the block, and when more than half the players have in this way become assistant keepers, the rest must return from hiding, and a new keeper is then chosen.

## THE LEAPING-POLE

The leaping-pole should be of strong wood, quite smooth, and not too heavy. The boy who uses it should not hold it too high up to begin with, and should not try to jump too far. He ought to make a short run, and, taking a firm grip with both hands, putting the right a little above the head and the left about two feet lower down, plant the foot of the pole on the ground, and lift himself up as it swings over. The height and length of the jumps should be increased by degrees. There is no healthier exercise than that with the leaping-pole, if it is used as it should be.

## THE JOLLY MILLER

The miller stands in the centre of a circle formed by the rest of the players walking round and round in couples, arm in arm. They sing this song as they walk:

"There was a jolly miller and he lived by himself,
As the wheel went round he made his pelf.
One hand on the hopper, and one on the bag,
As the wheel went round he made his *grab.*"

At the last word the couples change partners. Each outside player moves forward and takes the place of the inside player in front, who, at the same time, occupies the place left vacant by his partner. If the miller, however, can get a place first, the player who is left without a partner must take the place in the centre of the walking ring or wheel, and wait for the chance of "grabbing" someone else's place when the verse has been sung again.

# PREPARING A PICNIC LUNCH-BASKET

When we go for a picnic, it is best to take things which weigh as little as possible, if we have to carry everything ourselves, for we do not want a heavy load to tire us before we reach the spot decided on for lunch. So we choose a lightly-made wicker basket and light cardboard boxes for the eatables. We replace china plates by paper ones, linen serviettes by crinkled paper, the tablecloth by sheets of thin cartridge paper, such as is used for lining a chest of drawers, a salt-cellar by a screw of paper, and so on, taking as few knives and forks as we can possibly do with.

One or two teaspoons passed round to stir tea or coffee before drinking it will be found enough. Half the fun of a picnic is the contriving it involves in the absence of table accessories. Little papier mâché cups will do quite well in place of ordinary cups and glasses. As for the eatables, it is well to take things that will not spoil, crush, or melt when packed up, so we must avoid juicy, over-ripe fruit, and if it be the strawberry or raspberry season, take only the dry ones. They carry best between cabbage leaves, on the top of the basket, or in a punnet covered with leaves. Bananas, plums, greengages, peaches, apricots, apples, and oranges are quite easy to carry. Our lunch may be a very simple one, just enough to satisfy the hearty appetites of boys and girls, or something more elaborate to entertain our friends. Suppose we think about a simple lunch first.

A family picnic in the woods

We shall find hard-boiled eggs and bread and butter very satisfying, and easy to carry. The eggs are boiled for five minutes, and then placed in cold water for two or three minutes to harden them still more. We wrap each one in white tissue-paper and place them all in a card egg-box at the bottom of the basket, with a paper screw of salt. To eat with the eggs, we want slices of bread and butter. The slices should be cut the same size, and placed butter sides together in a pile. We may like to put between two slices a little mustard and cress, small sprigs of watercress, shredded lettuce leaves, or chopped nuts. The bread and butter or the vegetable sandwiches are then covered with oiled paper, such as confectioners use. The eggs can be cracked, shelled, and halved at the time of eating.

For those of us who do not care for eggs, we cut sandwiches of sliced tongue, ham, cold roast beef, or sausages, using a sandwich loaf of bread for the purpose, and taking care to cut the meat thin, and sprinkle over it a little salt, and mustard. Potted meat may be preferred, and is very quickly spread. Pressing the pile of sandwiches down with the left hand, we take a large, sharp carving-knife and cut off the crusts from the four sides of the pile. The sandwiches are then done up in packets of oiled paper, covered with thick white paper.

Another favourite item of a simple picnic lunch is chocolate and white bread. Indeed, a fancy roll and a thin tablet of milk chocolate, followed by one or two bananas and a few raisins, make a most satisfying meal.

If we have New England boys or girls in our picnic party they are sure to like a pie, and home-made sausage rolls generally meet with approval. They are easy to pack in paper or a card box.

A few little fancy cakes or biscuits, and fruit in sound condition, will be put on the top of our basket, and we shall hardly need knives and forks, a clasp fruit-knife being alone wanted for the fruit. In choosing the spot for lunch, we may have in mind a cottage or farm near, where we can get a supply of drinking water or milk. Failing that, we shall certainly need a bottle of milk and some mineral waters. Sherbet often meets with approval. It is not a bad plan for the different parties who join the picnic each to contribute provisions for the lunch, thus sharing the expense and dividing the burdens. One may be famed for a special kind of sandwich, another for scones or oswego cakes, another for lemonade. It is well in such a case to have a clear understanding about the contributions, so that provisions do not run short.

Now let us suppose a somewhat more elaborate lunch is to be packed, involving cold chicken, lobster, or veal and ham pie, and requiring knives and forks. Of course, we do not take our best cutlery, and so we cut up the fowl before packing it in oiled paper and wrapping it in a serviette outside that. Shredded lettuce goes well with the chicken, packed between two large outer leaves or cabbage leaves. There is no need to carry home greasy knives and forks. Kind earth cleans them nicely for us, if we just dig them sideways in the turf and wipe them on some of the tissue-paper.

If we are near a wood where sticks can be gathered, it is fun to light a fire and bake a few potatoes, with their coats on, in the ashes, or boil a kettle over large stones placed around it. Then, if we care to take a small spirit-lamp and apparatus, we can indulge in tea or coffee. condensed milk, to be opened on the spot, makes a very good substitute for cream; and a small pot of jam or marmalade is sure to meet with much appreciation from all.

# OUR LITTLE VEGETABLE GARDEN

## WHAT TO DO AT THE END OF JUNE

We may still continue the routine work, pinching out side growths from the tomatoes, and planting out the young "greens," thinning the carrots and beet, the lettuces and radishes, and getting the late celery into the trenches. Very soon we should begin to enjoy our earliest crops of lettuces, radishes, peas, and so on. The drier the weather, the more frequently should the hoe be used to keep the surface stirred and loose, and also, of course, to keep down weeds; and frequent watering may be necessary for the freshly transplanted young vegetables.

It is always a good thing, if we can manage it, to keep a small portion of our little plots as a nursery garden, where we may put in cuttings that we want to strike. Small seedlings may be planted here until we have space to remove them to their flowering quarters; and here, when the time comes, we may put in the runners of strawberries to root.

Some people who have not sufficient room to grow strawberries in their gardens make use of a novel method very successfully: they grow them in barrels, and in this way grow quite a number of plants on the smallest amount of ground space possible. The description as to how strawberries may be cultivated in this way may induce some of us to try the method. This is how it is done. A large barrel is obtained, and holes are made all round it about three inches in diameter, with a foot or fifteen inches from hole to hole. This means, of course, that there will be several tiers of holes, and each hole is to contain a strawberry plant. If paraffin barrels are used, all traces of the oil must first be removed; then they are filled with soil, which must be made quite firm and be given ample time to settle; more soil may be added later. Some people, in filling the barrels with soil, place a pole in the middle of the barrel and build up the soil round it; when quite filled they remove this, and thereby have a space which will hold water.

After the watering, it is as well to replace the pole—that is, of course, when the water is absorbed. The barrel should be filled some time before planting, so that the soil may become thoroughly firm, but in the meantime it should be watered, for if the bulk of the soil becomes dust-dry, it is very difficult to get it thoroughly moist again. We are thinking about this now, because early in July we may root our strawberry runners in readiness for the autumn, when we may establish them in the tub; but there is, of course, no hurry to fill the tub with soil for some while yet—it is the plants which must at present occupy our attention. But even now we may draw up a little soil around these runners while still on the plants. As a general rule, it is not a good thing to let the runners form; they should be cut off as they appear, in the same way as violet runners; but if we want to form plants, as many runners as we require plants must be allowed to remain. If the soil is drawn up round them, probably when the runners are removed they will be found to have already formed roots.

It may sometimes be necessary, even at the height of summer, to do a little planting in our flower garden; something may have failed or died, and we have an empty space to fill. Now, such planting requires considerable care, especially in hot, dry weather. If the plants we are to deal with are already growing in pots, there is not so much difficulty. We should water in the morning, and not attempt to plant them out until the evening. Having planted them, we should again water them, both at the root and, with the rose on the can, overhead. Shade for a few days is very desirable, and we may put some sticks into the ground around the plant, and then arrange a bit of light sacking, or anything we can find, round the outside of the sticks, and another piece lightly over the top. These can be removed during the night and replaced for the day for a short while, say, three or four days, unless it is cloudy and showery, when this shading will scarcely be necessary. But it is well worth while taking trouble to prevent a plant from receiving a severe check, and with this due care as to shading and watering during the first few days after moving, we need not hesitate to transplant a subject even in full flower if it be necessary.

We must look after our young seedling plants of wallflower and sweet-williams, and other things that we have been growing for next year's flowering. They should be pricked out in our nursery bed as soon as they can be conveniently handled, and they must be kept clear of weeds and watered when necessary. We shall plant them out where they are to flower in the autumn.

# ANSWERS TO THE PICTURE-PUZZLE ON PAGE 3510

On page 3510 we have a drawing of a large steamer beside a quay, and in it the artist made several mistakes. Here is a list of them.

1. There is no name on the bow.
2. The portholes open outward instead of inward, as they should open.
3. The scupper is opened the wrong way.
4. The rattlings are unfinished.
5. The numbers should read upward.
6. The foremast is leaning forward instead of backward.
7. The funnels also should lean back.
8. The waste steam pipes should be in front of the funnels.
9. The anchor-chain hole is the wrong way.
10. No ship in dock has an anchor down.
11. There are no ventilators, halliards, fore-top-mast stay, or side-light board.

THE NEXT THINGS TO MAKE AND THINGS TO DO BEGIN ON PAGE 3733

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